SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XL.—No. 15. [NEW SERIES.] NEW YORK, APRIL 12, 1879. [$3.20 per Annum. [POSTAGE PREPAID.]

AMATEUR MECHANICS.

CHASING AND KNURLING.

Among the multitude of operations possible with a foot lathe perhaps none is more vexatious to the amateur than that of cutting a good screw thread, and no acquirement is more valuable than to be able to chase a screw thread easily and accurately.

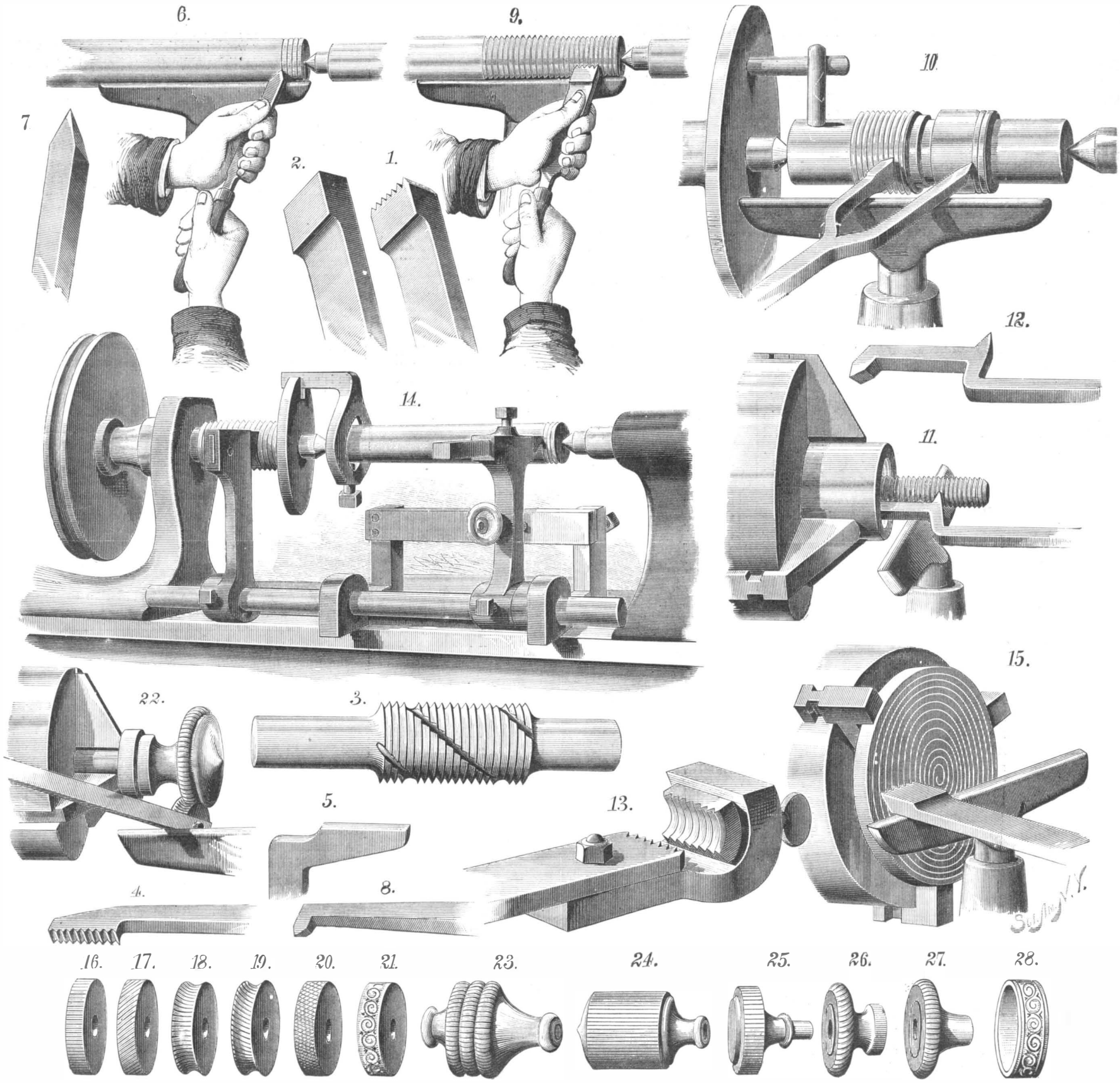
The ordinary chaser, Fig. 1, is a simple tool, which is easily made when one has the hubs for the different sizes; but wanting these, we recommend the purchase of chasers. A blank for an outside chaser is shown in Fig. 2, and the hub used in cutting the teeth is represented in Fig. 3. The latter consists of a piece of good steel having a thread of the desired pitch, which is traversed by spiral grooves to form cutting edges. This tool must have about the same temper as that of a tap. When used it is placed between the lathe centers and revolved at a slow speed, while the end of the chaser blank is held against it, being at the same time supported by the tool rest. The hub should be oiled during the cutting process. After cutting, the tool is hardened and tempered and ground on the elevated portion, which is the face, and smoothed on the back which slides upon the tool rest.

An inside chaser is shown in Fig. 4, the blank from which it is made in Fig. 5. For convenience in cutting the teeth, the blank is bent at right angles; after cutting and before hardening it is straightened.

The manner of starting a thread for chasing is shown in Fig. 6, the tool used in Fig. 7. The rest is placed a short distance from the work, the tool is held firmly upon it, and while the work revolves with a uniform speed the tool is moved dexterously so as to make a spiral line on the work, which is nearly, if not exactly, of the same pitch as the thread to be cut. If the operator is fortunate in the attempt, it will be a simple matter to start the chaser and move it along as indicated in Fig. 9. After a little practice it will in most cases be found an easy matter to chase threads without first starting them with a pointed tool. It is much easier to chase an inside thread than an outside one. A chaser seldom goes wrong when working on the inside.

A method of chasing thimbles is shown in Fig. 10. The threaded thimble which forms the guide screw is driven on the larger end of the tapering mandrel; the thimble on which the thread is to be cut is placed on the smaller end of the mandrel. One arm of the forked tool has a vertical chisel edge which engages the guide screw; the other arm has a chasing point which cuts the thread. The chisel edge is first brought into engagement with the guide screw, the point is then quickly brought against the work with more or less pressure. After the thread is well started it may be finished with an ordinary chaser or with a pointed tool.

Fig. 11 shows a method of starting an inside thread. The chaser has a tracing edge that follows the guide screw projecting from the center of the chuck, and a cutting point that forms the thread. Fig. 12 shows the tool in detail.



TOOLS FOR CHASING AND KNURLING.

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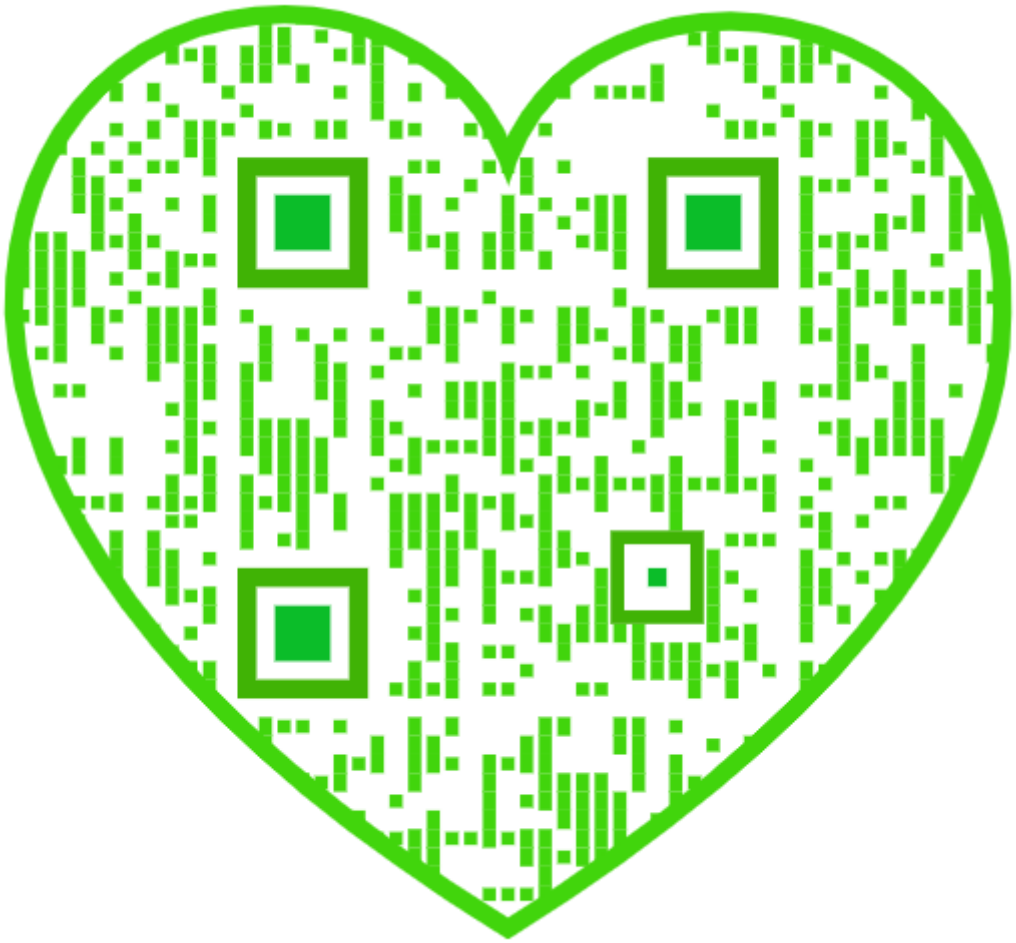

Threads cut by a chaser without some kind of a guide to start them are often more or less crooked or drunken. To correct such threads and in cutting large threads, the doctor, shown in Fig. 13, is sometimes employed. The follower opposite the chaser is moved up by the thumbscrew as the thread deepens.

The most expensive, and at the same time the most desirable, contrivance for chasing screw threads is shown in Fig. 14. A casting fitted to the lathe bed has two ears, which are bored to receive the round sliding rod carrying the tool holder and the tracer. The tool holder is placed on the sliding rod between the two ears, and it carries a well fitted screw, which bears against the horizontal bar supported by two square posts which form a part of the main casting. This bar forms a guide which may be adjusted within narrow limits by means of the screw seen in the right hand post.

The lathe is provided with a face plate having a long boss arranged to receive thimbles having leading threads of different pitches cut on them. The tracing arm carries a thin tracing tool which engages the threaded thimbles, and is capable of yielding to admit of moving the cutting tool forward against the object being threaded; but being well fitted to the mortise in the arm it cannot move laterally without carrying the sliding rod and all attached to it. The tracing tool is slotted to receive a pin which passes transversely through the head of the tracing arm, and in the slot is placed a spiral spring which tends to throw the tracer forward.

The operation of this device needs no special explanation. The arm that carries the cutting tool is moved forward until its adjusting screw strikes the horizontal guide bar; the tracing tool at the same time engages the leading screw and carries all forward. When the tool has traveled as far as desirable it is drawn back and returned to its original position. With this tool threads may be cut on either cylindrical or tapering work.

It is sometimes desirable to form spiral grooves in the face of a disk; this may be accomplished in exactly the same manner as in the case of the cylindrical work. The method of doing it is illustrated by Fig. 15.

Knurls of various patterns are shown in Figs. 16 to 21 inclusive; these are employed in "beading," "milling," or knurling the heads of screws, the handles of small tools, etc. The manner of using this tool is shown in Fig. 22. The knurl is placed between the forks of a holder and upon a pin that passes through the fork, and is held with considerable pressure against the work as it revolves.

The knurls shown in Figs. 16, 17, 18, and 19 are easily made. All that is required is a hub something like that shown in Fig. 3. This is placed between the centers of the lathe, and the knurl blank is brought in contact with it and allowed to revolve in a holder supported by the tool rest. The straight blank is moved up and down until every part of the surface is cut in the same way. The concave blanks cannot be moved, but the hub should fit the hollow of the face of the blank. The knurl shown in Fig. 21 must be made by a die sinker. Figs. 23 to 28 inclusive represent examples of knurling done with the different knurls shown in the preceding figures. M.

THE HOME OF THE METEORS.

In a recent lecture at Harvard College Prof. Benjamin Peirce put forth, according to newspaper report, a novel hypothesis with regard to the origin of comets and meteors. In the absence of any complete statement of the hypothesis, it is impossible to judge of its scope and pertinence, or indeed whether there is any new hypothesis at all. Apparently Prof. Peirce has simply added to the well known hypothesis of the meteoric origin of the solar system so cleverly elaborated by Proctor, the suggestion that beyond the outermost planets there remains a vast shell of fragmentary matter, an envelope of bolides, out of which comets and meteors come. In other words, the home of the metors is simply that portion of the original nebulous mass lying beyond the region of aggregation which has resulted in the sun and planets, and thinned out, so to speak, the planetary spaces. Why this outer shell should be characterized as the special home of meteors is, however, far from clear, unless it be assumed that the interplanetary spaces have long since been entirely gleaned of their original supply of matter, so that the existing bolides, with which these spaces seem to be thickly sown, must have come from the outermost parts of the solar system.

An incidental point brought out in the lecture is novel, namely, that the heat which the earth is known to receive from space is to be attributed to the impact of meteors upon our atmosphere. That this meteoric heat is not an insignificant quantity Prof. Peirce shows by computation, by which he reaches "what he calls the unexpected and startling result, that the heat which the earth receives directly from the meteors is the same in amount as that which it receives from the sun by radiation."

Emery Belts and Wheels.

A correspondent says that most users of emery belts and emery wheels do not use glue that is thick enough, fearing it may chill before the sand or emery can be spread. In making an emery wheel or belt, if the cloth has never been glued, it should be sized with glue about as thick as lard oil, and allowed to dry thoroughly before applying the glue which holds the emery. Have the emery heated to 200° Fah., and coat the belt or wheel with glue about as thick as molasses and roll it in the hot emery. If a wheel or belt thus treated is allowed sufficient time to become thoroughly dry it will be very serviceable.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

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VOL. XL., No. 15. [NEW SERIES.] *Thirty-fifth Year.*

NEW YORK, SATURDAY, APRIL 12, 1879.

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VIII. MISCELLANEOUS.—The Possibilities of the Mackerel Fisheries. By S. RICH.—The Reproduction of Eels. By R. B ROOSEVELT.

AMERICAN AFFLUENCE OF MECHANICAL INVENTION.

Discussing the influence of American rivalry in producing or helping to produce the present depressed condition of the English cotton trade, a writer in the London *Times* makes the following comparison to show the "startling" difference in the rate of progress in this department of productive industry, characteristic of the two countries.

In the twenty-five years between 1853 and 1878 the average weekly production of English weavers rose from 825 yards in sixty hours, to 975 yards in fifty-seven hours; an increase of 23 per cent in the rate of production, due to improvement in processes. During part of the same period, the decade between 1865 and 1875, the cotton operatives of America, with a numerical increase of 150 per cent, increased their aggregate rate of production 500 per cent. In other words, the progress due to improvement in processes was more than ten times as rapid in America as in England.

This remarkable—from an English point of view, startling—difference in the rate of industrial progress was attributed by the *Times* writer very largely to the more ready adoption of labor-saving inventions by American masters and the superior intelligence and deftness of American operatives. Still further, the writer notes as a cause of difference the circumstance that for some time American manufacturers have brought to bear upon their processes "an eager spirit of improvement and economy, combined with a remarkable affluence of mechanical invention," in consequence of which they are able to produce many grades of goods at a less cost than their English rivals can.

The origin of the "affluence of mechanical invention" which has done so much for the American cotton industry, the *Times* writer does not attempt to trace absolutely. He discovers, however, one important source of American inventiveness in "the simplicity, cheapness, and efficiency of the method by which inventions are protected (in this country)—methods which offer a lively contrast to the cumbrous and costly devices by which England contrives to strangle the inventiveness of her people."

These are strong words; but they are by no means without parallel in many English publications of recent date. Every earnest and appreciative student of American industrial progress, whether native or foreign, has been equally impressed by the superior efficiency of the American patent law, in promoting industrial improvement through mechanical invention; and not a few foreign statesmen have urged the necessity of similar laws for their own countries, in several cases with no small degree of success. We must infer as an inevitable result that the competition of such nations for the control of the markets of the world will henceforth be increasingly intelligent and severe. The affluence of mechanical invention which has brought us to our present stage of prosperity must not be diminished—indeed, must be steadily increased—or our position in the industrial race will be forfeited. If we have caught up with, or surpassed, our older rivals through the encouragement of invention, we must encourage inventors still more, or those who have lately entered on the same course of industrial advancement, and thereby lessened our relative advantage, will beat us at our own game. This is as inevitable as gravitation.

In view of these indisputable facts, does it not seem strange that any one having the prosperity of American industry at heart—or even professing to have it at heart—can seriously advocate the abandonment of the principle and practice to which our industrial progress has been so largely and so manifestly due?

Whatever may be the faults and deficiencies of the American patent system they certainly do not fall on the side of over encouraging invention or over-guarding the inventor's right to the proceeds of his own thought and labor. If any change in the system is advisable, it certainly does not involve any additions to the inventor's inevitable burdens; nor any increased privileges to those who would like to appropriate his inventions without his consent or due payment therefor.

JADED HEADS.

The school of popular morality which ruled a generation ago is responsible for no little mischief; and its teachings have not yet quite gone out of fashion. It knew but one virtue—unceasing application to work or study; but one sin—the neglect of business for recreation. For a man to stop work to rest himself or to play was a symptom of inherent laziness, or worse, an inclination toward moral, mental, or physical dissipation. Untiring industry, even when unnecessary, was raised to the topmost pinnacle of social virtue; and to say that a man "died in the harness," was to pronounce the highest eulogium.

A reaction has taken place; yet the fashion of overdoing still compels many a man to toil on unnecessarily after the physical and mental strain has become all but unbearable; and too often, by the time a man has trained a young family to life conditions which only a large income can sustain, he breaks down and leaves his children to bear the brunt of a poverty made tenfold more severe than it otherwise would be by the daintiness of their previous living. And even when the broken down merchant or professional man leaves his family a competence, they are very apt to inherit an ill-balanced and ill-nourished nervous system, which makes a positive and sustained enjoyment of life an impossibility.

In a recent lecture in this city, Dr. C. R. Agnew said that if there is more nervous disease in this country than elsewhere, it is because the average American youth is supposed to be able to do anything. Men should know on what points they are ignorant, and so escape many damaging strains.

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Mental application does not weaken the brain. It strengthens it, if not carried to the length at which wholesome food and plenty of sleep fail to refresh it. Never in any age, said Dr. Agnew in another connection, have man's faculties been so taxed as now; and the great problem is for each man to do his share of the world's work and keep well. The civilization of to-day does not call for any faculties that a man does not possess; but it calls upon him to use in the best manner the faculties he has and learn how to bear the strain of living.

One of the first and most imperative symptoms that the strain of living is becoming too great is the jaded head, which Dr. Agnew described as one that cannot be depended upon for a long stretch of work, that grows weary prematurely, that has to be coaxed from the pillow in the morning, and that does not force the work of the day cheerfully. "There are more of such heads than might be supposed. They are found in every rank of life; but chiefly among persons of sedentary pursuits and among both sexes and almost all ages above fourteen. Generally the early symptoms of the malady is discomfort during headwork in the back of the head and in the upper part of the spinal region. He is a happy man who meets this symptom with rest, and seeks in sunlight and fresh air some fresh investments for his nervous system, and drops every habit that does not do him positive good. If he takes to artificial stimulants for relief, he will begin a career which, soon or later, will place him among the incurables or bring him to an untimely end. Alcohol and all sleep-producing drugs are dangerous in the highest degree; for they mask the malady, without curing it. No organ in the human body is so abused as the brain, and no organ is so well fitted for daily use. Still, the brain is not so susceptible to disease as some suppose. It was probable there was not a man present who had not during the day abused his brain by overwork, anger, tobacco, alcohol, fuss, hurry, too little sleep, too much sleep, by indolence, by not studying to be quiet, by not doing his own business, by attempting to do something beyond his reach, by attempting to do something for which he had not been sufficiently educated, by carrying an evil conscience, or by the unmanly strain of trying to outdo his neighbor. The remedy of the jaded head is the giving up of all habits which cannot be defended by the highest kind of reasoning; the careful determining of each man of his ability to stand work; the avoidance of doing anything for which a man has no adequate education; rest, recreation, and the keeping up of the tissue-building powers by wholesome food."

WOMAN THE PRIMITIVE POTTERY-MAKER AND DECORATOR.

In an interesting article by the late Professor Hartt, reprinted in the *American Naturalist*, the author, after copious extracts from the writings of those who have traveled among the various savage tribes of the globe, shows that among such peoples generally the art of pottery making is, at first, exclusively practiced by women, the reason being that the fabrication of earthenware is primarily and essentially a branch of culinary work—the latter everywhere falling to the lot of the gentler sex. Among savages, man is the hunter, fisher, and warrior; while the woman takes care of the house and the culture of the field. When, however, in the progress of the tribe in culture, the practice of the art of pottery comes to be a trade or profession, and to interfere with the household work, it passes naturally into the hands of man, and it will be found that in every case where men make earthenware the tribe has advanced considerably beyond the savage state.

But savage woman not only makes the vessels of clay, she also ornaments them, and if the fictile art has originated with her, and has grown up under her hands, it seems no less probable that the ornaments she uses should have originated with her; and the probability is increased by the fact that to her falls the work of spinning and weaving, and of making and decorating personal ornaments and clothes, and of making baskets, mats, etc. She is everywhere the primitive decorative artist, and to-day it is the exception that man occupies himself with ornamental art, even in civilized countries. Woman covers with ornament everything her hand touches, and the lady in her boudoir industriously embroiders, on some article of mere luxury, the same series of frets and scroll borders that, on the Amazons, the savage unclothed squaw as diligently and with as firm a hand traces with a spine on the damp surface of the clay vessel she is fashioning. It is as if they both sang the same simple song. The ornaments are in both cases identical, and not only of wholly independent origin, but it may be of very different age. Those of the savage are the mere embryonic beginnings of art life, while those of the boudoir are archaic forms, persisting through the ages, still flourishing unchanged among the varied wealth of derivatives by evolution from the ancient primary forms.

WIRE IN WHEAT.

The difficulty with regard to the presence of bits of iron wire in wheat after it reaches the mill, due to the use of harvesters binding with wire, seems to be in a fair way to satisfactory solution.

At the late meeting of the Millers' Association at St. Paul, a method of extracting wire from wheat was tried with encouraging success. Two gangs of common horseshoe magnets were placed in a spout, through which wheat was passed after having been mixed with particles of wire, varying from the size of a pin head to pieces an inch in length. In every trial all the pieces (which had been counted) were found upon the magnets.

The committee appointed to test the matter more thoroughly have reported that magnets had been placed in the Pillsbury, Washburn, Arctic, and Holly mills, and used for several days. The opinion of the committee was that the wire was chiefly, if not wholly, removed by the magnets, and that by their use the evil attending wire bands can be lessened. The resolution of the millers against wire binding has been substantially withdrawn.

The device employed in the tests at St. Paul and Minneapolis was not patented. A patented invention for the same work is described as consisting of a revolving iron cylinder, through which the wheat is passed. During each revolution of the cylinder, it is twice, automatically, connected with and disconnected from an electric battery. Inside this cylinder an endless apron is run lengthwise. Each time the "circuit" is broken, the cylinder is, for a moment, demagnetized, and the particles of iron it has picked up drop upon the endless apron and are carried out. There would appear to be an attractive field here for the exercise of inventive skill.

APPLICATIONS OF CELLULOID.

An excellent illustration of the industrial and commercial benefits that may arise from new products, whether gleaned from the unused stores of nature or created by the skill of the inventor, is furnished by the wide and various utility of the compound of cellulose and camphor known as celluloid. Though scarcely ten years have passed since the Hyatt brothers suspected that this compound might be used profitably in the arts, and only five years since they began to manufacture it successfully, it has become the basis of several thriving industries, and novel applications of it are being made almost daily.

As now made celluloid is a composition of fine tissue paper and gum camphor, treated with chemicals by a patented process. When crude it looks like a transparent gum, and its color is a light yellow brown. It can be made as hard as ivory, but is always elastic, and can be readily moulded into every conceivable form. With equal ease it can be colored in any tint desired, the dye running through the entire substance, and being, therefore, ineffaceable.

A writer for the *Evening Post* has taken pains to collect a large amount of information concerning the manufacture and use of this material; and wide as the range of its application has become, the business of preparing the crude material and shaping it into novel and useful forms is thought to be only in its infancy. According to the *Post* writer, all the celluloid used is made by a single company, having factories at Newark, N. J., who sell the crude material to the parties undertaking the production of finished goods. No one can buy it unless the producing company decides to give him a license, which is granted only for the purpose of making some new article that will not interfere with the trade of the companies already licensed. A number of large corporations are now engaged in the various branches of manufacture for which celluloid can be employed. Most of these have their factories in Newark, but there is one large establishment in Center street, this city.

The cost of the crude article to the buyers is regulated by the producing company according to the use to be made of it and the competition met with in other materials. For instance, $4 or $5 per pound are charged for celluloid which is to be made into jewelry, while only $2 are charged if it is designed for umbrella handles, though there is no difference in the quality of the substance.

As a close imitation of ivory, celluloid has made great inroads in the business of the ivory manufacturers. Its makers assert that in durability it is much superior to ivory, as it sustains hard knocks without injury, and is not discolored by age or use. Great quantities of it are used for piano and organ keys, to the manufacture of which one company is devoted.

Billiard balls are made of celluloid at half the price of ivory, and are said to be equally elastic, while more durable. Large amounts are used for combs, for the backs of brushes and hand mirrors, and toilet articles; a fine tooth comb made of celluloid is twenty-five per cent cheaper than ivory, while in large pieces, such as the backs of hand glasses, the difference in price is enormous. Among many other articles in which celluloid takes the place of ivory or India-rubber are whip, cane, and umbrella handles, every kind of harness trimmings, foot rules, chessmen, and the handles of knives and forks. Its use in cutlery is said to be especially desirable, as it is not cracked or discolored by hot water.

India-rubber, as a general rule, holds its ground against celluloid, as the latter cannot be sold so cheaply. The celluloid is said to be much more durable, however, and it is superior for pencil cases, jewelry, etc., where gold mountings are used, as it does not tarnish the metal, whereas the sulphur in India-rubber tarnishes gold which is less than eighteen carats fine. The freedom of celluloid from sulphur, and the natural flesh color which can be imparted to it, have caused it to be extensively substituted for India-rubber in the manufacture of dental blanks, or the gums and other attachments of artificial teeth.

Celluloid can be mottled so as to imitate the finest tortoise shell, and its elasticity renders it much less liable to breakage. In this form it is used, like the imitation ivory, for combs, card cases, cigar cases, match boxes, pocket books, napkin rings, jewelry, and all sorts of fancy articles. The substance is employed for similar purposes as a good imitation of malachite and also of amber. It is made into mouth pieces for pipes, cigar holders, and musical instruments, and is used as the material of flutes, flageolets, and drumsticks. For drumheads it is said to be superior to parchment, as it is not affected by moisture in the atmosphere.

As a substitute for porcelain, celluloid is used for the heads of dolls, which can be hammered against a hard floor without danger of fracture. Beautiful jewelry is made of it in imitation of the most elaborately carved coral, reproducing all the shades of the genuine article.

One of the large manufacturing companies is employed exclusively in the making of optical goods, using celluloid in place of tortoise shell, jet, etc., for the frames of spectacles, eye glasses, and opera glasses. The material is extensively used for shoe tips, protecting the toe as well as metal tips, and having the appearance of patent leather. By shoemakers it is also used for insoles. Large quantities of thimbles are made of it, and it is said to be the best material known for emery wheels and knife sharpeners. As a ground for paintings, celluloid has all the advantages of ivory, and photographs can be taken on it which are alleged to be superior to ivorytypes.

Within the last year and a half another branch of celluloid manufacture has been developed which promises to reach enormous proportions. This is the use of celluloid as a substitute for linen or paper in the making of shirt cuffs, collars, etc. It has the appearance of well starched linen, is sufficiently light and flexible, does not wrinkle, is not affected by perspiration, and can be worn for months without injury. It becomes soiled much less readily than linen, and when dirty is quickly cleaned by the application of a little soap and water with a sponge or rag. For travelers and for wear in hot weather this celluloid linen is especially convenient. It has lately been much improved by the introduction of real linen between two thicknesses of celluloid. Shirt fronts have been made of it, as well as cuffs and collars, and it is believed that these will prove equally desirable.

Celluloid has been experimented with as a material for neckties, and although the trials have not yet been very satisfactory, it is thought that they will eventually be successful. For hat bands and hat sweat bands it is a trifle more expensive than the materials commonly used, but it is said to be better, as it does not become rusty or greasy. It has also been used lately for watch cases.

There is a large export trade in celluloid articles to Cuba and South America, and this is constantly increasing. They are not sent to Europe, as the right to manufacture and sell them there has been sold to a foreign company, which has a factory in France.

Photography in Banking.

The London *News* reports that the Bank of France has for some time past employed a photographic detective to examine suspicious documents; and more recently has placed an invisible studio in a gallery behind the cashiers. Hidden behind some heavy curtain the camera stands ready for work; and at a signal from any of the cashiers the photographer secures the likeness of any suspected customer. It is also reported that in the principal banking establishment in Paris several frauds have lately been detected by the camera, which under some circumstances exercises a sharper vision than the human eye. Where an erasure has been made, for instance, the camera detects it at once, let the spot be ever so smoothly rubbed over, while a word or figure, that to the eye has been perfectly scratched out, is clearly reproduced in a photograph of the document.

Seaboard Pipe Line.

The long talked of project of extending a pipe line from the oil producing regions now seems in a fair way to be realized. We are informed by one of our correspondents that the Tide Water Pipe Line Co. (Limited) are progressing with their line of oil conducting pipe, which reaches from the Bradford oil region to Williamsport, Pa., a little over 100 miles. The pipe is 6 inches internal diameter, 27-100 inch thick, and weighs 19 pounds to the foot. It is tested to 2,000 pounds to the square inch. The lengths are screwed together dry. The pumps are being made by the Holly Manufacturing Co., of Lockport, N. Y. They are single acting plunger pumps, 6 inches in diameter, set in batteries of three, and are to be driven by a slide valve engine 20 x 30.

There will be two pumping stations, 50 miles apart. The minimum amount of oil to be delivered in twenty-four hours is 6,000 barrels of 42 gallons. The pumps will deliver the oil to the pipes at a pressure of 400 pounds to the inch. A large portion of the work is done. It is expected that the line will be in operation in May.

Alligators Taught by Experience.

The alligator season begins to open, and these ugly monsters may be seen stretched out on the wharfs dead and alive. Every man that is fortunate enough to kill a good sized alligator puts it down among his memoranda and feels as proud as a Bengalee who makes conquest over a royal tiger. But these saurians have become more wary and watchful, and the sound of the steam whistle, the noise of the paddlewheel, or the dip of the oar is to them a signal of danger, so that the first approach of an enemy causes them to disappear. To secure a large alligator now requires an expert who knows their habits. There is a great waste of powder and ball by inexperienced parties who go hunting and find nothing.—*Pilatka (Fla.) Herald.*

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NOTES ON FAIENCE AND ITS MANUFACTURE.

No. II.

The word "faience" is now generally used to designate that class of earthenware which, consisting of an interior body of white or colored clay, is externally covered with an opaque enamel, the base of which is formed of oxide of lead and tin. The art of enameling was introduced into Europe by the Arabs in the eighth century, subsequent to the invasion and subjugation of Spain. While enamel was at first used only to decorate pottery, it was gradually applied as an impermeable covering to replace the old primitive glazing. From Spain this art soon found its way into Italy, where goods enameled in this manner were called "majolica," from the island from which the first goods of this character had been imported. The largest majolica works in Italy were situated at Faenza, a small city near the river Po. A potter employed in that town, toward the end of the thirteenth century emigrated to France, and founded there the first majolica works, at Nevers. From the maker's native place these goods received in France the name "faience," which has since been universally adopted.

The faience industry soon became very important throughout France; this was especially due to various improved processes and apparatus invented by Bernard Palissy, of Saintes. The goods produced by him at the latter place were highly esteemed for their artistic merits, and are even to-day eagerly sought for by antiquarians. In Italy the ornaments were generally formed by hand, while Palissy used moulds of plaster of Paris and wood for that purpose. In this way he was enabled to furnish an unlimited number of copies of the same design at a lower price than his opponents, and he soon controlled the entire market. His eminent success induced King François I. to establish a faience factory at Rouen, and it was at that place that this branch of industry subsequently attained its highest development. Nicholas Poirel and one Poterat were the first private persons to which royal letters of permission were granted to engage in faiencery, in 1644 and 1673 respectively; in course of time that favor was conferred upon many others, and in the eighteenth century thousands of men and women were employed in the numerous workshops of that place. Rouen ware was very heavy but tasteful, blue being the predominating color, and employed in all shades. Few other colors were used.

From France faience was gradually introduced into Germany and England. Nuremberg potters were especially renowned for their productions, and for nearly a century the faience of Hirschvogel and his sons, the principal manufacturers of that city, was exported to foreign countries all over the world. In England, Wedgwood, by his many improvements, his skill and energy, elevated the faience industry to the rank of one of the prime factors of English wealth.

In commerce there are distinguished two classes of faience principally, the "common" and the "fine." Common faience is again divided into the "brown" and the "white." For making brown faience the following mixture is generally used:

Clay	30 parts.
Green marl	36 "
White calcareous marl	12 "
Sand or quartz, containing a little clay	22 "
	100

White faience is composed as follows:

Clay	8 parts.
Green marl	36 "
White calcareous marl	28 "
Impure (aluminous) sand	28 "
	100

These materials are finely pulverized and then mixed in large rectangular tanks with sufficient water to form a thin, easily flowing liquid. The stony particles subside, and the supernatant mass is then drawn off through a sieve provided at one end of the tank, into large ditches dug in the ground in the neighborhood of the factory. These ditches are lined with cement, and in them the clay is exposed to the influence of the air. By this means its qualities are greatly improved. This is probably due to the action of the air on the iron and other metallic oxides present in clay. After three or four months the pulp is taken out and worked for some time on a table like dough. It is then formed in large balls, and again laid aside for several months in cellars or excavations to "ripen," by which it is said to be further improved in quality. Previous to use it is thoroughly kneaded with the feet and divided into portions of about 50 lbs. each, which are distributed among the formers for further manipulation.

Circular vessels are shaped on the wheel, moulds of wood, metal, and plaster of Paris being used for other shapes. Figs. 1 and 2 represent the wheels used in the operation. Fig. 1

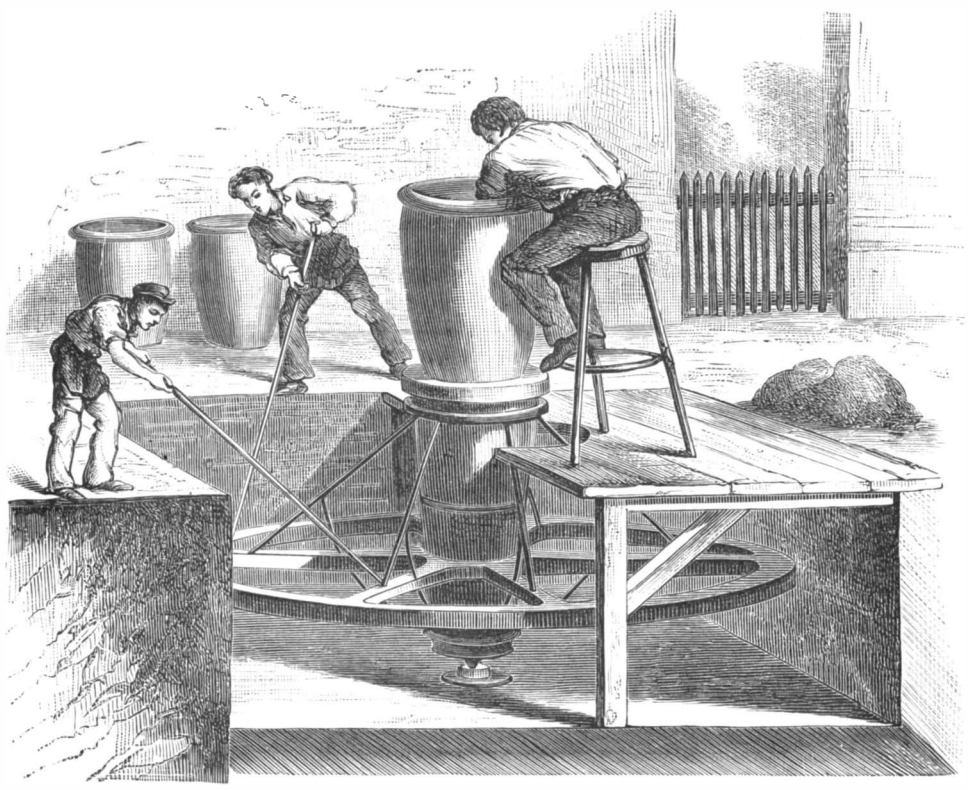

Fig. 1.—POTTER'S WHEEL.

shows a wheel used for pottery of larger dimensions; Fig. 2 one for making small ware. After being moulded the articles are dried either in the air or in special drying rooms, and then go to the "finisher," who, with an iron or steel tool, perfects the form and makes the necessary impressions. Next, the handles and various ornaments are attached and dried again in a hot air chamber, when the goods are ready for the oven.

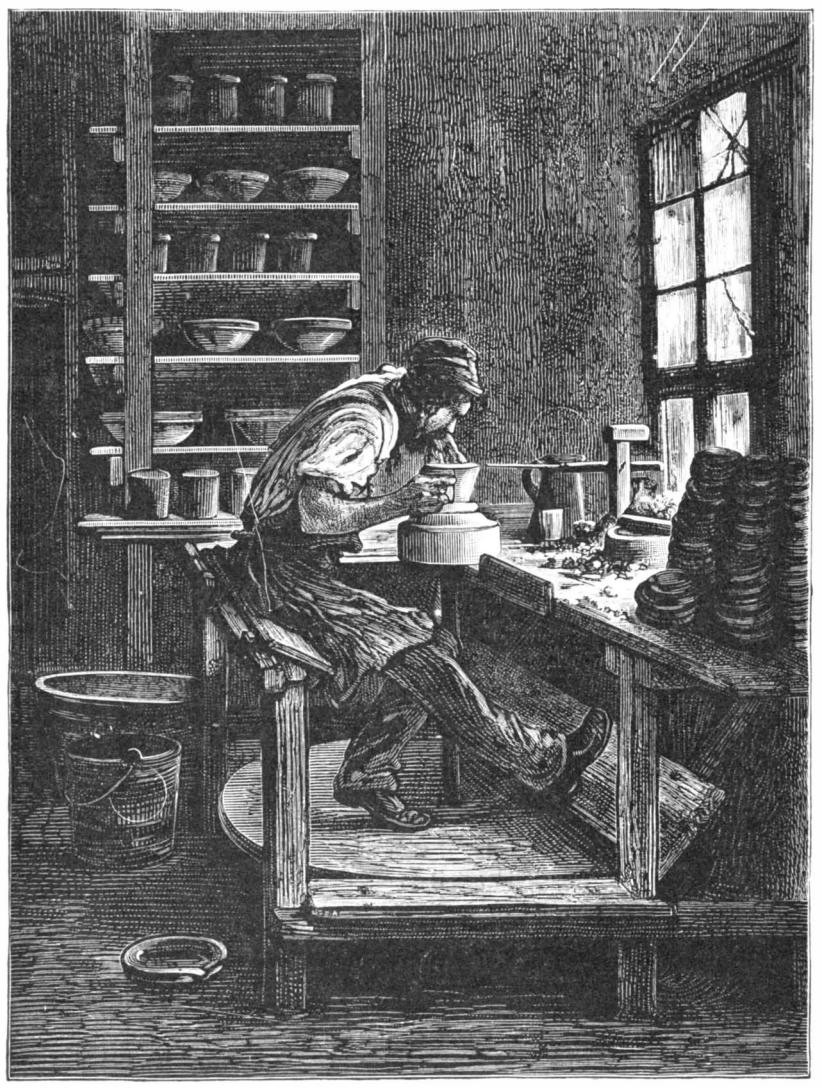

Fig. 2.—WHEEL FOR SMALL WARE.

Photographs at Midnight.

WE have before us a photograph of the spooling room of the Willimantic Linen Company's Thread Works, which was taken at midnight. The room is lighted by two Brush electric lamps, which replace sixty-two five-foot gas burners. The photograph indicates that every nook and corner is well lighted.

RECENT MECHANICAL INVENTIONS.

An improved end gate for wagons, patented by Mr. J. H. Sifers, of La Cygne, Kansas, will, when opened, catch the loose material composing the load as it falls. It may readily be converted into a trough for feeding horses and other purposes.

Mr. George Chamberlain, of Olean, N. Y., has patented an improved press for shaping leather and sheet metal caps for horse collars. It is constructed so that a number of caps may be shaped simultaneously.

An improved guide for the stems of stamping mills has been patented by Messrs. C. Crane and Wm. Raup, of Park City, Utah Ter. It consists in a continuous casting running along the guide rail, and having semicircular boxes with removable top caps for confining gibs, which may be readily removed when worn.

An improved lubricator, patented by Edward F. Gordon, of Concord, N. H., is applicable to hand planes, and the beds of planing, moulding, and scraping machines. The invention consists in holes or cavities formed in the surface to be lubricated, the cavities being filled with wood or other unyielding porous material saturated with oil.

An improved machine for pumping, forcing, and blowing, recently patented by Mr. Robert Johnson, of Sudley, near Manchester, England, has several novel features which cannot be explained without diagrams. The machine may be used either as a pump, a blower, or a motor

An auxiliary governor for steam engines, invented by Mr. John Milton, of Hamilton, Va., is operated by the tightening of the main belt at the instant the engine is called upon to perform additional labor.

Important Patent Flour Case.

We noticed in our last issue the fact that the millers of the West who had combined to resist the claims of the Middlings Purifier Company, had been successful in defeating the latter. It being one of the most important patent suits of the times, and one affecting the interests of so large a Western industry, a brief statement of the invention and the nature of the trial, which we find in the *Commercial List*, cannot fail to interest a great many readers of this paper.

About the year 1870, a new process of manufacturing flour was introduced into Minnesota by George H. Christian, by which the middlings were purified and then ground into flour. The middling flour was found to contain so much more gluten than the ordinary superfine flour as to render it much more valuable as an article of food. This new process flour commanded from one to two dollars per barrel more in the market than the superfine flour. Shortly after this the new process flour was introduced into the St. Louis mills, and is now manufactured in the principal first-class mills in the country. In 1874, a man named William F. Cochrane obtained the reissue of an old patent granted to him in 1862. In this reissued patent he claimed the process of manufacturing flour from purified middlings, and claimed a license fee from all the mills making the new process flour. He commenced suit against one firm in Georgetown, D. C., for infringement of his patent, which suit was carried into the Supreme Court of the United States, and his patent there declared valid. An association, called the American Middlings Purifier Company, then purchased the patent, and commenced suit against Christian & Co., of Minneapolis, who were then using the process in the largest and most extensive mills in the United States located at that place. He claimed of them $200,000 damages, and the court required them to give security to that amount. The owners of the patent at that time estimated the claims against the millers of the country at over $30,000,000. The millers of the country associated together in convention and employed George Harding, Esq., to defend them from this claim. He immediately applied to the Supreme Court of the United States to vacate the decree in the former suit as obtained without a full investigation of the patent, and the defense of the millers in Minneapolis and St. Louis was at once undertaken by him. The case was argued at St. Louis before Judge Dillon, of the Circuit Court of the United States, Judge Treat, of the District Court of Missouri, and Judge Nelson, of the District Court of Minnesota. The decision declared the Cochrane patent void, and dismissed the bills of complaint.

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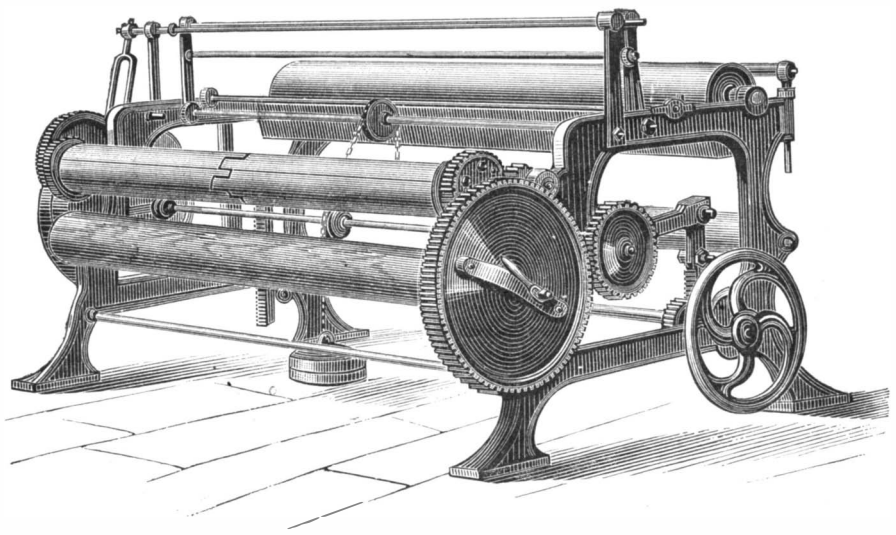
MACHINE FOR STRETCHING AND SOFTENING CLOTH.

The machine illustrated in our engraving is the invention of Mr. Devilder, and is designed for stretching and softening woolens, linens, and other fabrics. Several cylinders and rollers are supported by a cast iron frame, and operated by power transmitted by a belt and gearing. The necessary pressure on the goods is produced by a weight, pulleys, and levers. The goods, rolled on the lower cylinder in the rear part of the machine, are carried between a zinc cylinder and a wooden roller situated directly above the lower cylinder. The zinc cylinder runs in a trough filled with water. By this means the necessary degree of moisture is imparted to the goods. They are next taken up by a bar at the top of the machine, which may be regulated so as to increase or lessen the tension of the goods. From this bar the goods pass to the stretching cylinder, which is composed of sixteen copper plates revolving around, and alternately approaching to and receding from a common axis. The approach takes up the first half of the revolution and the return the second half. The goods, by this means, are well stretched; they are afterward rolled on a wooden cylinder below the stretcher. This machine has been extensively introduced throughout France.—*Revue Industrielle.*



MACHINE FOR STRETCHING AND SOFTENING TEXTILE FABRICS.

A Canadian Canal Project.

A special committee of the Ontario Legislature have reported in favor of the proposed Huron and Ontario Ship Canal. They think that the hydraulic lift lock will be the principal means of overcoming the difficulties in the construction of the canal. The estimated cost is $20,000,000. Of the utility of the canal the committee say:

"A cargo of grain shipped from Chicago through the Sault Ste. Marie Canal, Lakes Huron and Erie, and the Erie Canal by way of New York to Liverpool, would traverse a distance of 4,600 miles. The same cargo, passing through the proposed canal, and going by the St. Lawrence canals by way of Quebec, would only have to traverse a distance of 3,766 miles, a saving of no less than 834 miles. Even compared with the Welland Canal the gain in distance is very great. From Chicago to Quebec by the Welland Canal is 1,500 miles, while by the Huron and Ontario Ship Canal it would be 1,180 miles, a saving in distance of about 320 miles."

After making due allowance for tolls, the estimated saving in the cost of shipping grain from Chicago to Liverpool, by the proposed route, would be close upon $3 a ton.

A NEW ATTACHMENT FOR BOILERS.

A great amount of attention has been bestowed upon the economical consumption of steam, and the more vital question of economy in the generation of steam has been more or less considered. While many improvements have been developed, no very remarkable results have been heretofore attained. The accompanying engraving, however, shows an attachment for boilers which promises to be important. A number of practical tests extending over a considerable time appear to demonstrate that the correct principle has been arrived at.

The invention, which is exceedingly simple, may be readily understood by reference to the engraving. A steam pipe extends along the face of the boiler arch, as shown in Fig. 1, and connects with a series of small nozzles placed concentrically in bell-shaped tubes that extend through the fire arch wall, as indicated in the sectional view, Fig. 2. These nozzles are inclined slightly downward, and the steam which enters through them tends to hold the gases down near the fire, where they are subjected to intense heat; this, in connection with the air which is drawn in through the bell-shaped tube, and the steam which is partly or wholly decomposed, produces a very high heat and insures the complete combustion of the gases. This effect is realized even where the natural draught is insufficient to maintain the required steam pressure, as it is found that wherever the apparatus is applied the draught is greatly improved. Another thing which is of secondary importance is the entire absence of deposits on the boiler or flues.

The inventor claims that this apparatus will not only save a large percentage where a good quality of coal is burned, but it will enable a poor quality of coal to be used with good results.

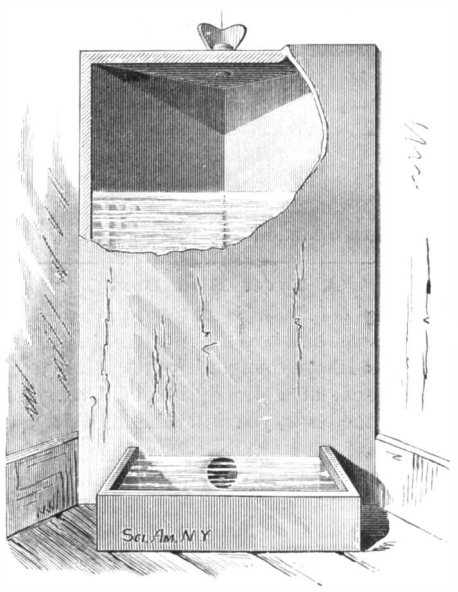
We have before us a report of tests made on a steamer plying on one of the Western rivers, which indicates an important saving in coal. We are also informed that it is in successful use on some of the leading railroads. For further information address Mr. F. C. Mathews, 237 and 239 Canal street, New York.

MATHEWS' BOILER ATTACHMENT.

FOUNTAIN WATERING TROUGH FOR CATTLE.

The watering trough shown in the annexed engraving is especially designed for use in connection with cattle transporting cars. Its principle is essentially that of the reservoir of the well known student lamp. The upright tank which holds the water fits the corner of the car. A drinking trough is attached to the front or wider side of the reservoir, and communicates through a threaded aperture with the reservoir, which has at the top a stoppered aperture for filling.

As the cattle drink from the trough, the water becomes lower than the top of the threaded aperture and air is admitted to the reservoir, allowing water to escape until the aperture is again covered. By this operation the trough is always kept full of fresh water until the reservoir is exhausted.



JOHNSON'S WATERING TROUGH FOR CATTLE.

The reservoir is filled through the stoppered aperture at the top, after closing the lower aperture with a screw plug.

This apparatus takes up none of the room of a car which would be available for other purposes, and it affords a needed relief to cattle, that are not too well treated at best. This watering trough is the invention of Mr. Samuel Johnson, of Philadelphia, Pa.

Have we too many Colleges?

Professor R. D Hitchcock, a profound thinker and writer who has but few equals in any land, lately addressed the graduating classes of one of the medical colleges in this city. Passing over that portion of his address to the students in which he gave them wise counsel as to their duties on entering the field of their profession, we proceed to the Professor's closing remarks. Alluding to the three professions, medicine, law, and divinity, in which, he claims each has its own science or group of sciences to cultivate, he adds:

"The professions are to society what the brain is to the body. But the brain may be too big for the body, or may get too much of the blood. This is what is the matter with Greece to-day. A university with more than fifty professors, and more than twelve hundred students, for a people numbering only a million and a half, is something to be looked at twice, and looked at all around, before we applaud it. If these young men, when they quit the university, would also quit Athens, return to their sunburnt homes, to plant trees, sow crops, ply trades, build roads, and launch vessels, Greece might hope to be Greece again—the Greece of Pericles as well as Plato. I may be blamed for saying it, but I am honestly of the opinion that our American civilization also is overdoing itself professionally, not in quality, but in quantity. Political economy is now in rapid development, and will be able to tell us, by-and-by, with a great deal of precision and certainty, the proper normal proportion between the four great classes which we call agricultural, mechanical, commercial, and professional. Meanwhile, I think it safe to say that we are just now making too many doctors, such as they are; too many lawyers, such as they are; too many ministers, such as they are. I do not forget that the Christian ministry claims to be, and is, preëminently a service, not wholly of this world. But it is likewise a profession, and as such, amenable to economic law. I know, too, very well, that no profession is crowded near the top. But too much crowding at the bottom hurts the top; too much competition for the lower places cheapens the competitors; so that candidates for the higher places are fewer, if not inferior. In regard to your own profession, tell me whether it is yielding to-day its proper proportion of great practitioners and authors? I may be mistaken about the other professions, though I know them better; but my impression is that the law is not yielding to-day its proper proportion of jurists and statesmen, nor is divinity yielding its proper proportion of great preachers and theologians.

"Our educational system, I feel constrained to say, is, in my judgment, seriously defective. Of academies like those at Exeter, Andover, and Easthampton, we have too few, of colleges and professional schools, we have too many. If some of them would only die, bequeathing their endowments to institutions better placed and better appointed, it would be a great gain. Under present conditions, the next best thing to be done is to inaugurate everywhere a system of rigid examinations. Such examinations may thin our ranks for a time, perhaps permanently. If only for a time, the wisdom of the policy will soon be vindicated. If permanently, it will prove that our ranks should have been thinned long ago."

Ornamenting Steel Surfaces.

Bright steel surfaces may be ornamented by painting the patterns intended to be left bright, in Brunswick black. If the ornament is to be dead upon a bright ground, the patterns must be left untouched, and the ground painted over. Aquafortis—diluted nitric acid—should then be poured upon the exposed parts of the steel, and in a few minutes it will be seen to have eaten sufficiently into the metal. Wash off the aquafortis with water, and Brunswick black may be removed with turpentine. If the steel is made blue by exposure to heat, the blue color can be removed, where it is not required, with white vinegar or other weak acid, the parts to remain blue being protected by Brunswick black. On the parts from which the blue is removed further variety may be gained by painting additional ornaments in Brunswick black, and exposing the remainder of the ground to the action of the aquafortis Gilding on steel was formerly performed with a spirit, but now it is best to send the work to an electro-gilder's, first painting over those parts not to be gilt with Brunswick black. The gilding may be performed at home by the following method: It is known that if sulphuric ether and nitro-muriate of

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gold are mixed together, the ether will, by degrees, separate from the acid nearly the whole of the gold, and retain it for a long time in solution. Take ether thus charged and with a soft brush paint the parts of the design intended to be in gold, and after giving the ether time to evaporate, rub over the parts thus gilt with a burnisher.

MISCELLANEOUS INVENTIONS.

A scoop, whose body consists of an unbent wooden veneer or circular section of a wooden block, has been patented by Mr. William C. Freeman, of Louisiana, Mo. The head is rabbeted and secured to the bowl by glue and pins or nails.

An improved neck yoke has been patented by Mr. Charles Hauff, of Ashland, O. It consists in making the part usually called the "leathers" of rubber and linen cloth or duck in one continuous piece, and in such a manner that there will be a core of duck or linen cloth deeply covered by rubber.

An improved furnace for roasting ores has been patented by Mr. C. E. Robinson, of Brooklyn, N. Y. The process of roasting, as conducted in this furnace, consists in subjecting the pulverized ore simultaneously to the action of a jet of flame, and a jet of air, steam, or gas introduced underneath the charge. By this means the particles of ore are kept in continual suspension during the operation of roasting

Mr. George Neally, of New York city, has invented an improvement on the smoke excluding mask, for which he received letters patent September 18, 1877. The improvement renders the mask more simple and compact. The mask is intended for the use of firemen and others to prevent suffocation by smoke.

An improved bill file, patented by Mr. Michael Posz, of Shelbyville, Ind., consists of a case containing a number of shelves which rest upon a carrier, supported by springs attached to the bottom of the case. The shelves are lettered in a peculiar manner, and an index is arranged at the side of the case.

An improvement in dress shirts, patented by Mr. Henry F. Elias, of New York city, provides a pocket for the reception of the handkerchief, purse, etc., and at the same time makes that part of the shirt body, between the side seams and bosom, and from the yoke to the waistband, two-ply.

Messrs. E. H. Krier and C. L. Ervin, of Plum Creek, Neb., have invented an improved stencil plate for marking cattle. The improvement consists in attaching to the plate an upper flange to confine the acid, and a downwardly projecting flange that surrounds the letters, and is pressed into close contact with the hide of the animal to prevent the spread of the acid employed in forming the mark.

Mr. Edward G. Grahn, of Indianapolis, Ind., has devised an improved carriage curtain fastener which is simple, secure, and easily operated.

The Calamity at Szegedin.

The destruction of the Hungarian city of Szegedin by flood, March 12, is one of the worst disasters of the age. Szegedin was one of the foremost commercial and industrial cities of the Austro-Hungarian empire, and contained a population of about 72,000, which number had been increased to 80,000 or more by refugees driven in from the surrounding country by the flooding of the river valleys.

Szegedin was built on a marsh on both sides of the Theiss, at the junction of the Maros, a Transylvanian river, and was divided into a central town, in which the merchants' residences were grouped around an old fortress, an upper and a lower town, and New Szegedin, on the east bank of the Theiss. The city had a large market place, several churches, convents, hospitals, and a Magyar theater. Its trade was considerable, owing to the facilities which the Theiss affords for communicating with the country districts. It received corn, rapeseed, tallow, and other Hungarian products in large quantity and distributed them throughout the Austro-Hungarian empire. It had several prosperous factories, being noted for the manufacture of superior boats and floating mills. The merchants dealt largely in wines, timber, and manufactured goods from Vienna and Bohemia.

A less severe inundation of the city occurred in 1870, and in 1874 the suburb of New Szegedin was submerged. The government then proposed to change the course of the Maros, which pours immense volumes of water into the Theiss, by cutting a canal and guiding the river round New Szegedin, and joining it again with the Theiss on the south side of the suburb. By thus leading away a large portion of water and straightening the channel of the Theiss above Szegedin, it is said that inundations could be absolutely prevented, but the project had not been carried out. The highest portion of the city is said to be not more than 12 feet above the low water level, and the only precaution the government has thus far taken to save the city from annual inundations is by surrounding it with strong dikes. It was by the bursting of these dikes that the disaster occurred. The loss of life and property was enormous.

The Polariscope Adopted for Testing Sugar.

A report has been made to the Treasury Department that the experiment of washing sugars to discover their true color has been found impracticable, and Secretary Sherman has issued an order that the Cuban centrifugal sugars now being received shall be polarized and otherwise tested to ascertain whether they have been artificially colored after crystallization; and in all cases reported as artificially colored for the purpose of evading the duty in part, an increase of three quarters of a cent a pound shall be levied. In the order the Secretary establishes 92° as the extreme test of polarization for sugars to be classified as not above No. 7 Dutch standard; all above that test of saccharine strength to be classified as from No. 7 to 10, or from No. 10 to 13, Dutch standard.

Customs officers state that this order has been considered necessary by the Treasury Department to prevent low grade centrifugal sugars with high saccharine strength from being admitted on the lowest rate of duty.

Correspondence.

Collecting Postage Stamps.

To the Editor of the Scientific American:

Last summer I visited several summer resorts in different parts of the country, and found a universal mania prevalent for collecting postage stamps from letters which had passed through the mails. The reasons given for this were various. At one place I was told that a rich gentleman in Boston had agreed to give a poor boy a situation for life, but as a preliminary test of the boy's business capacity and perseverance, he required him to collect enough postage stamps to paper the side of a room.

The next story I heard was that a wealthy young lady in the South had made a bet that she would collect a million of postage stamps in a certain time, and had called upon all her Northern friends to assist her in doing so.

Again, it was stated that these stamps are used in the making of *papier maché*; but this is such arrant nonsense that I can hardly suppose anybody would believe it seriously.

The most common story, however, is that the object is a charitable one—that if a certain number of stamps can be collected, some old woman or some crippled boy is to receive a place in an institution, where he or she will be cared for for life. This view is received with implicit belief by many excellent people, who work with great earnestness to carry out the object by inducing their friends to save all their old envelopes.

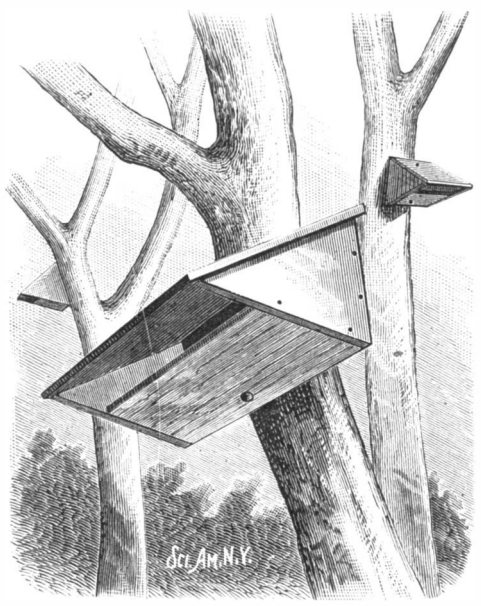
It ought to be stated for the information of all, that in nine cases out of ten, the real object of collecting these stamps is to cheat the government, by washing off the Post Office mark by means of a chemical preparation, and then selling the stamps again.

An ostentatious announcement was made a few days ago in one of the city papers, that $800 had been paid to a lady for charitable purposes who had collected a million of these three cent stamps. An investigation will show that they all go through various channels to certain parties who are engaged in defrauding the revenue. The rascals can well afford to pay $800 as an advertisement, for a million of three cent stamps when cleaned are worth $30,000. D.

A Novel Bird Box.

To the Editor of the Scientific American:

I have made some bird boxes for my trees that are so unique and simple that I have thought it worth while to give your readers the benefit of a description of them. I hope, in the interest of the birds, you will think as I do.



They are made of half-inch white pine, and painted; they require fourteen 1¾ finishing nails, as also two larger nails to fasten them up with. They afford the same kind of sheltered nook that birds seek. J. V. MEIGS.

Lowell, Mass., March 7, 1879.

The Giant Snapping Turtle.

To the Editor of the Scientific American:

Will you kindly allow me space to correct a few errors in the article on the giant snapping turtle in your issue of March 22? In the first place the author has confounded three species—*Trionyx ferox* (not *ferus*), now *Aspidonectes spinifer*, *Aspidonectes ferox*, and a totally distinct turtle, *Macrochelys lacertina*, the alligator terrapin of the Mississippi. The first of these inhabits the northern and middle tributaries of the Mississippi and St. Lawrence; the second the rivers of the Gulf States from Georgia to Texas; the third is also an inhabitant of the Gulf States, being most abundant in Louisiana. It is to this last that the remarks about size and weight apply. This turtle has a slight resemblance to our common snapping turtle, but is distinguished by three lofty dorsal ridges, and its huge neck and head; the neck being so large as to be but partially retractile. The alligator terrapin does occasionally attain a length of five feet and a weight of sixty to eighty pounds. The soft shelled turtles never attain this size and weight, a very large specimen of *A. ferox* measuring but two feet eight inches in length.

FREDERIC A. LUCAS.

Rochester, N. Y., March 16, 1879.

Grafting Eyes upon the Blind.

To the Editor of the Scientific American:

In our community, as elsewhere, there are large numbers of blind persons, blind because some part of the mechanism of the optic lobes is unable to respond to the influence of light; this is often the case when no imperfection exists in the muscles or nervous channel of communication to the brain. This is an established fact of ocular science.

It is also true that where a finger may be entirely severed from the hand, by accident or otherwise, if taken in season, replaced and properly held in position, and if skillfully treated, union will result; this has been true in my own case. Now, there can be no question but that the nerve fibers distributed through the fingers are susceptible to the most delicate sensations. The practice of skin grafting is also common in surgery. So is the transfusion of blood from the healthy person's veins to the sick. If the foregoing is admitted, is there any reason why, proper conditions being observed, a sound, healthy eye could not be ingrafted on the muscles and nerves which had previously been severed from an imperfect eye?

In this and all other communities there are annually, we might say weekly, numbers of criminals put to death under sentence of capital punishment. Whatever may be said of the moral condition of these criminals, it is certain that their physical condition is usually good. The question may here arise, do these unfortunate persons possess anything that may be preserved and become useful to the humanity they have outraged? It would, of course, seem cruel and inhuman even to propose the extraction of the eyes, or other essential organs, before death, or where there was a possibility of the individual regaining consciousness.

But in this connection we may ask if it is necessary to perpetuate the time honored (or rather dishonored) mode of executing criminals by strangulation; or would it seem any more inhuman to civilized beings to cause death by means of chloroform or ether? If not, could not the criminal who is to give up his life, and the patient who is blind, be placed under the influence of ether at the same time, and the transfer effected before life becomes extinct on the part of the criminal? This at least would be a painless way of expiating the sentence of the law.

As a matter of course, doubtless, many patient and delicate experiments would have to be performed before the plan here proposed could be brought to success; but such experiments, I think, may be performed on dumb animals, using every precaution to prevent unnecessary suffering.

D. A. REARDON.

Boston, March 21, 1879.

AUSTRALIAN INSECTS IN CALIFORNIA.

Prof. C. V. Riley, Entomologist of the United States Department of Agriculture, reports that serious complaints have come from the Pacific slope during the year, of a new insect that is killing many of the orchard and ornamental trees in that section of the country. Specimens received from Mr. A. W. Saxe, of Santa Clara, California, show it to be a species of *Dorthesia*, an abnormal bark louse (family, *Coccidæ*). It is an Australian insect (apparently *D. characias*, Westw.), and has of late years been introduced on Australian plants into South Africa, where, according to Mr. Roland Trimen, curator of the South African Museum, it has multiplied at a terrible rate, and become such a scourge as to attract the attention of the government. It has evidently been introduced (probably on the blue gum or eucalyptus) to California, either direct from Australia or from South Africa, and will doubtless become a great evil, because most introduced insects are brought over without the natural enemies which keep them in check in their native country, and consequently multiply at a prodigious rate. The best remedy is a judicious use of kerosene or linseed oil.

The Texan Cattle Drive for 1879.

The *Express* of San Antonio, Texas, reports that the prominent stock raisers and drovers of that region almost unanimously unite on an estimate of 175,000 to 200,000 head as the number of this year's cattle drive from Texas. The first number is considered low, and the last the greatest that can be expected. The greater proportion of the drive will be yearlings and two-year-olds. Prices are considered high, but holders are firm. The demand for cattle is very good, but the transactions have been rather light of late, many who came to Texas to buy preferring to wait for better rates, or, failing in that, to take their chances after the cattle reach the North. There is talk of stopping the drive entirely for a few years in order to raise the price of Texan cattle. It is thought that by so doing the Northwest would be drained of cattle, and the old prices for Texan cattle restored. The plan seems hardly feasible, however, and the indications are that the great ranges of the Northwest will ultimately wrest from Texas the control of the cattle trade.

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THE HESLOP STEAM ENGINE.

The South Kensington Museum has just received an important addition to its collection of primitive engines, in the sole remaining specimen of the type of steam engines invented by Adam Heslop and patented by him in 1790—a class of engines, by the way, which has been entirely overlooked by those who have attempted to trace the origin and development of the modern steam engine. This oversight is all the more remarkable, since the Heslop engine has been, in the Cumberland coal field, a somewhat successful competitor of the improved engine of Watts; and is furthermore important in that it contains the germ of the compound engine of the present day.

The Heslop engine (now honorably retired, in company with the Soho "sun and planet" engine, and the locomotives "Rocket," "Sanspareil," and "Puffing Billy") was built about 1795, and has been in use ever since in the colliery of the Earls of Lonsdale, at Whitehaven. As described by Mr. H. A. Fletcher, of that place, before a meeting of the Royal Institution of Mechanical Engineers, this engine is furnished with two open-topped cylinders, on each side of the main center of the beams, and both of them single acting, although their pistons are acting in the same direction. These cylinders are described respectively as the "receiving cylinder" and the "working cylinder," the latter being possibly so-called lest Boulton and Watt should contend it was only a condenser with a piston in it; but in actual practice they were known, and perhaps more correctly, as the hot cylinder and the cold cylinder. The steam, on being admitted into the first or hot cylinder, helps to raise the piston by its pressure underneath; the return stroke is then made by the weight of the pump rods, etc., in the pit, suspended by a chain working over an arched beam head. During the down stroke of the pump rods, the eduction valve being opened, the steam passes from this cylinder to the second or cold cylinder by means of the connecting pipe, constantly immersed in a trough of cold water, which produces sufficient condensation to "kill" or reduce it to atmospheric pressure as it enters and fills the cold cylinder. The cold piston having arrived at the top of its stroke, and its cylinder being thus filled with steam, the injection valve is opened, admitting a jet of water beneath the piston, and thus bringing a vacuum into play. In the case of rotative engines the return stroke was made by the weight of the connecting rod, crank, and a heavy pair of links attaching the hot piston to the beam, assisted by the momentum of the flywheel. The two pistons are heavily weighted in equilibrium, and the action of the steam in the hot cylinder is simply to take off the weight of the hot piston, and allow that of the cold piston to come into play. This arrangement is necessitated by the arched head and chain connection, which, though proper to receive a pull, will not admit of a thrust. In order to prevent the possibility of injection water passing from the cold cylinder to the hot one, the latter is elevated above the level of the former.

By this arrangement of two cylinders Heslop obtained advantages closely approaching those of the separate condenser, and effected a signal superiority over the atmospheric engine of Newcomen, even as it then existed with all the structural improvements introduced by Smeaton; who was compelled to admit that, in its best state, 50 per cent of the steam was wasted by the alternate heating and cooling of the cylinder.

Mr. Heslop does not appear to have been guided by any fixed rule in the relative proportionate capacity of the two cylinders. In the specification drawing they appear to be practically equal in contents, while in five instances in which the dimensions have been ascertained, the hot cylinder is invariably the larger, being respectively 8, 53, 75, 78, and 87 per cent larger in capacity than the cold one. Doubtless he found sufficient reasons for gradually decreasing the proportions of the cold cylinder, but with higher pressures of steam than were then in use, there seems no cause why these proportions might not be reversed.

In the engine described by Mr. Fletcher the hot cylinder is 34 inches diameter, with 2 feet 10 inches stroke, and the cold cylinder 25½ inches diameter, with 3 feet 3 inches stroke. The wooden beam has been frequently renewed, and a symptom of fracture in the present one is met by two pieces of old boiler plate patched over the middle portion; the present hog-backed shaped is modern, the original beam having been parallel in form. The air pump of 12 inches diameter has been an after-addition; and the shifting valve in the cold piston is plugged up, being apparently no longer necessary. A drawing, made about the year 1823, shows an air pump placed outside the cold cylinder, and worked through a double radius parallel motion, by means of a small beam attached to the end of the main beam by a long connecting link. Nevertheless the cold piston still did its work through a chain and arch head, and it was probably not till 1837 that the now existing links and cross-head guides were substituted. The original cast iron flywheel shaft has been replaced by a wrought iron one of the same dimensions. The winding gear is on a second motion shaft, which is not parallel to the first, and is driven from it by a bevel pinion on the flywheel shaft, working into an ordinary spur wheel with parallel teeth upon the winding shaft. The curiously bent connecting rod was a common feature in all Heslop's rotative engines; and though its obvious intention is to clear the hot cylinder, he contended that it gave a certain amount of elasticity which was beneficial and desirable. The cold water pump discharges itself on the top of the cold piston, from which it overflows on the up stroke into the cistern on which the cylinder is placed. This engine also pumps, by means of a cast iron beam added about forty years ago, and placed some 4 or 5 feet above the level of the main beam, to which it is connected by links.

Fifteen engines on the Heslop principle have been thoroughly authenticated. The inventor, Adam Heslop, was the son of a blacksmith, settled at Workington, and said to be a Scotchman. In company with his brothers, Adam followed the same craft, which then included what little was known or requisite in the fitting of machinery and the use of the latter. In very early life he removed to Coalbrookdale, for the purpose of improvement and experience in the neighboring iron district. When his engine was patented he was living at Kelby, near Wellington, in Shropshire. In 1798, or the following year, he founded the Lowca iron works, near Whitehaven; and so far as known, his engines were used exclusively in that region.

Effect of Boiling upon Milk.

It is well known that boiled milk has a totally different taste as well as different physiological effects from unboiled milk. According to Schreiner the peculiar odor and taste of boiled milk are due to sulphureted hydrogen, as can be easily proven. If milk is placed in a flask fitted with an upright cooler, and then boiled, sulphureted hydrogen gas escapes from the tube and will blacken lead paper. After the milk has been poured out of the flask enough sulphureted hydrogen gas will remain in it to give the reaction as well as smell. Milk that has been boiled, on standing, will not curdle as soon as that which is not boiled, as every housewife knows. But Schreiner says that it curdles sooner than unboiled milk if acids are added. He placed 10 c.c. of milk, diluted with 25 c.c. of distilled water, in a flask, and added dilute sulphuric acid containing one half gramme acid to the liter. A certain definite quantity of acid was always required to produce a visible coagulation. Fresh milk which had been boiled always took 10 to 12 per cent less of this acid than it did before boiling.

The action of rennet upon milk is also affected by boiling. He found in numerous experiments that were made with the milk of different animals, that ten times the quantity of rennet required to curdle raw milk was insufficient to produce this effect upon boiled milk of the same kind and at the same temperature (95° F.), in ten times as long a space of time. The quantity of acid or of rennet necessary to curdle a given volume of fresh milk was found to depend upon the quality of the milk, *i. e.*, the amount of dry substance, or total solids. The milk of different kind of cows kept upon the same food required different amounts of acid. If equal quantities of rennet were added to different samples of milk, the time required for coagulation at a given temperature increased with the amount of dry substance in the milk. The quantity of acid required to coagulate milk from the same cow at different periods increased regularly from calving to the time of drying up, corresponding to the constant increase of solids in the milk during the period of lactation. The total increase of solids for the whole period was 11 to 13 per cent in the Frieslander breed of cows, 12 to 16 per cent in those of Simmenthaler breed.—*Chem. Centralblatt.*

Executive Ability.

Very few men are blessed with the talent of doing more than one thing well. In the economy of nature our gifts, as a rule, are few. One may be able to plan but cannot execute, while his neighbor's executive ability is his strong point. This man is good at the wheel, but lacks financial ability; another one can design china and earthenware of superior style, but falls short of success as a business manager. Similar experiences are met with in every trade. Men may succeed in the routine of designing, and in other departments of potting, but when their success in any one of these encourages them to essay manufacturing, they are all at sea, simply because the latter position calls for the exercise of entirely different qualifications. Now and again we find notable exceptions to this rule. We meet occasionally with men who possess a combination of different and varied excellences, superior wherever they are placed; but, on the whole, such instances are rare—so rare, in fact, that the exception only proves the rule. Such men are successful. They must be, for they possess every requisite in the whole range of mechanical and executive ability. Other men, who know nothing, practically, about the details of construction and qualities of materials, sometimes succeed, but they have an executive power well developed, and, supported by a clear judgment trained by experience, they master all difficulties.

One class of men may not know how to draw the simplest pattern, but, on the other hand, they may possess good taste, which will enable them to decide whether a design is good or bad, and their discernment foretells its reception with the trade. Give them a basis and a plan, and they will complete the structure. On the other hand, those who have the practical routine thoroughly by heart, but lack the executive power, generally fail in their attempt to do business. What we wish to impress is the importance of executive talent. It is the all-powerful lever. It is not always a gift. In nearly every man there is a germ, which, with proper cultivation, will develop this train to a certain degree. Young men learning the business should study it in all its bearings, and afford it every opportunity for growth. With it success is possible, even if mechanical genius and practical apprenticeship are wanting, but without it the best workman is unfitted for independent business operations. We do not urge this point to the exclusion of others, but we know its possession is imperative. Too much knowledge concerning the details of a business cannot be had, and whatever else you lack, do not fail to cultivate the executive faculty.—*Pottery Gazette.*

AGRICULTURAL INVENTIONS.

An improved plant digger, patented by Mr. Andrew Kreider, of Annville, Pa., has a blade like that of an ordinary spade, at the upper end of which there is an eye or loop for receiving the foot. There is a socket at the top of the eye for receiving the handle.

In an improved harrow, patented by Mr. John H. Yager, of Jacksonborough, O., the harrow sections may be jointed by hinge straps of different lengths to change the angle of the sections in relation to the central axis of the harrow. Handles are applied, which may be arranged as runners upon which to draw the harrow from one place to another.

An improved machine for rolling and pulverizing plowed ground has been patented by Mr. Earl D. Fink, of Columbus, O. It consists in a roller having a surface of rods or bars which cut the clods of earth. Spiral flights or conveyors are placed inside the roller to assist in leveling the ground and to convey to the end of the roller the earth which enters through the bars.

Mr. James P. Karr, of Monticello, Ind., has patented a beehive having a broad chamber with an inclined bottom and hinged detachable frames. The honey box is supported on pins, and provided with detachable frames with intermediate glass covers. The object of the invention is to render every part of the hive accessible and to facilitate cleaning.

A Shower of Pollen.

An uncommonly heavy fall of pollen occurred in the Lehigh Valley of Pennsylvania, March 16, in connection with snow. As usual, the circumstance was widely telegraphed as a shower of sulphur—a fair illustration of the persistence of error in the popular mind. Not a year passes without one, perhaps many, such falls of pollen in various parts of the country; and every year the mistake of calling it sulphur is corrected in the more intelligent newspapers; but the delusion will not down. Under the microscope the yellow dust which fell in such abundance at Allentown and Reading proved to be pollen of the Southern pine, probably brought by the storm from the pine forests of Virginia, perhaps the Carolinas or Georgia. The blossoms of the Pennsylvania pines were probably not far enough advanced at that date to furnish the quantity of pollen observed. These minute particles are carried by the wind sometimes hundreds of miles.

Reproduction of Ancient Glass.

Within the last two years the secrets so vainly sought for of the glass-blowers of antiquity have been found out by the modern representatives of perhaps the oldest industry in Europe, and the celebrated "murrhine" of Pliny and other objects of veneration to connoisseurs are now reproduced (not imitated) by the deft and learned workmen of the Venetian Isles. So great is the gain to science, that the heads of the most famous glass manufactories in Europe (as well as most of the different *musées*) have bought at very high prices samples of these revived arts of the ancients, and the Cross of the Legion of Honor has been awarded to M. Giovanni Castellani, the Director of the Royal Society of Murano, by the French Government, for the discoveries of the society in this department of art, and for its services in connection with the recent Exhibition at Paris.

Conditions of Idiocy.

In the annual report of the Pennsylvania Training School for feeble-minded children, for 1878, two interesting facts are noted. The statistics of the institution show that a larger proportion of males than females are admitted, the ratio being greater than can be explained except on the presumption that idiocy, like other infirmities, strikes with most severity the male; also that in the order of birth nearly half the idiots are first-born children, a fact strongly suggestive of a special line of ills to which the first-born are peculiarly liable, and to which they so often succumb either in death or in chronic disease. These disadvantages, the superintendent remarks, are often a sad recountal of the young mother's unfitness either for the genesis, nourishment, or intelligent care of her offspring. It is also noted that of the whole number (288) present in the institution at this date, 150 are half orphans and 74 whole orphans. This startling fact would seem to prove the assumption of some writers, that idiocy is one of the results of a degeneracy of race, by which, after a long exposure to debilitating influences and excesses, it ends in premature death, in scrofula, idiocy, or sterility.

Success of Wood Pavements in London.

The asphaltum pavements, which were being extensively laid in London six years ago, have been mostly taken up in the business sections and wood pavements substituted. The greater portion of the Strand is now laid in wood, and it is being laid at various points of Cheapside, Fleet street, up toward the Bank of England. Some of the suburban streets are also paved with wood. A bed of asphaltum is at first laid and allowed to harden, and on this the blocks are laid. They are of hard seasoned wood and are first kyanized. After being laid, coal tar is poured in all the crevices, and when opened for travel it presents a very solid and enduring appearance. It has been in use for a couple of years in the neighborhood of Charing Cross, and it is solid and perfect as when first laid. The asphaltum caused great injury to horses, as it became very slippery in wet weather, and for this reason was removed and abandoned.

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Spurious Oil Paintings Reproduced by Photography.

Under certain circumstances photography may with advantage be employed as an auxiliary of the fine arts; but there are others where all true artists would resent its intervention as an intrusion. Among the latter must be classed some pictures that have recently been produced by painting in oil on the back of photographs rendered transparent by means of Canada balsam, or some such method; these photographs are then passed through the press, and are thus made to resemble oil-paintings. Some speculators are busy exhibiting these pictures in Paris in the hopes of getting up a company for their manufacture and sale on a large scale.

Pictures thus reproduced by photography are to be palmed off especially for the decoration of churches, and thus a mechanical imitation of Rubens or Van Dyck, Titian, or Raphael, will take its place as an ecclesiastical altar piece. Good-by, then, to all the tradition of art, to all enthusiasm for the old masters, to all encouragement of living artists, if such forgeries as these are to prevail. Photography would be degraded in such a service, and deserve nothing but condemnation. In reproducing what it beholds, or as the handmaiden of art, photography can render great services; but if it be employed in supporting mechanical frauds, in imposing upon ignorance, or in promoting bad taste, it will be scouted by all who possess a love for the beautiful.—*Photographic News.*

RECENT INVENTIONS.

A novel arrangement of fireplaces, flues, and chimneys in kilns for burning bricks, tiles, or other earthenware, has been patented by Mr. Nicholas Lodge of Naapirville, of Aurora, Ill. The construction of the kiln is such as to secure an even "burn."

An improvement in road planers, patented by Mr. Joseph P. Lafetra, of Shrewsbury, N. J., consists of a blade suspended diagonally from the under side of a frame supporter by wheels, and provided with an elevating and depressing screw, by which the blade is thrown into position for use, or raised so that it may be moved about.

Mr. William L. Allen, of Belle Plaine, Kan., has patented an improved baker's cabinet, which is provided with flour chests placed so as to deliver flour to sieves placed over the mixing bowls; it is also provided with compartments and drawers for containing spices, lard, etc.

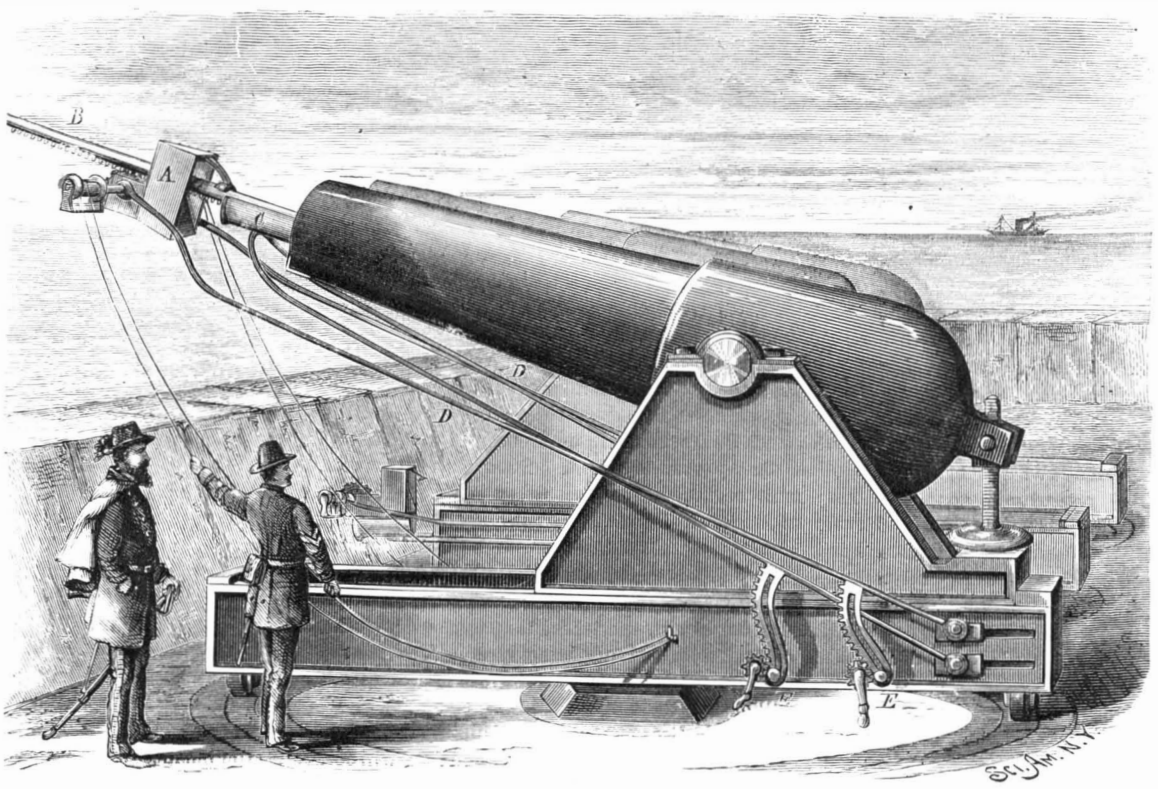
An improvement in stringing beads, invented by Messrs. S. M. & J. C. Lewes, of Providence, R. I., consists in making the end bead with a cavity to receive the knot on the end of the string, and with a screw plug for confining the knot.

NEW LOADING APPARATUS FOR ORDNANCE.

The accompanying engraving represents a novel gun-loading attachment recently patented by Lieutenant D. D. Johnson, of the Fifth U. S. Artillery. The aim of the inventor in planning the apparatus has been to produce a loading device which may be applied without altering the present style of gun carriages, and which may be operated from a position considerably below the muzzle of the gun.

A staff carriage, A, is supported by rods, D, which may be raised or lowered by the racks, E, and their pinions. The staff carriage, A, carries a short shaft, upon which there is a pinion for driving the sponge staff or rammer staff, also two drums for receiving the rope by which it is rotated.

The first operation in cleaning the gun is to raise the staff carriage, A; the sponge staff is then run through the carriage as far as convenient; the free end of the staff is then raised by means of a rod fitted with a fork for the purpose. As soon as the teeth of a rack with which the sponge staff is provided, engage the teeth of the pinion in the carriage, the pinion is turned by means of the ropes, forcing the sponge into the bore of the gun. The sponge staff carries a drum by means of which it may be revolved when the sponge reaches the end of the bore. The sponge staff is withdrawn by reversing the motion of the pinion in the carriage. The cartridge rest, C, receives the cartridge, shell, or shot, and carries it to the muzzle of the gun. The rammer staff is then inserted and operated in much the same manner as the sponge staff. After loading, the staff carriage and the cartridge rest are lowered out of the way to permit of the ready adjustment of the gun.



JOHNSON'S LOADING ATTACHMENT FOR ORDNANCE.

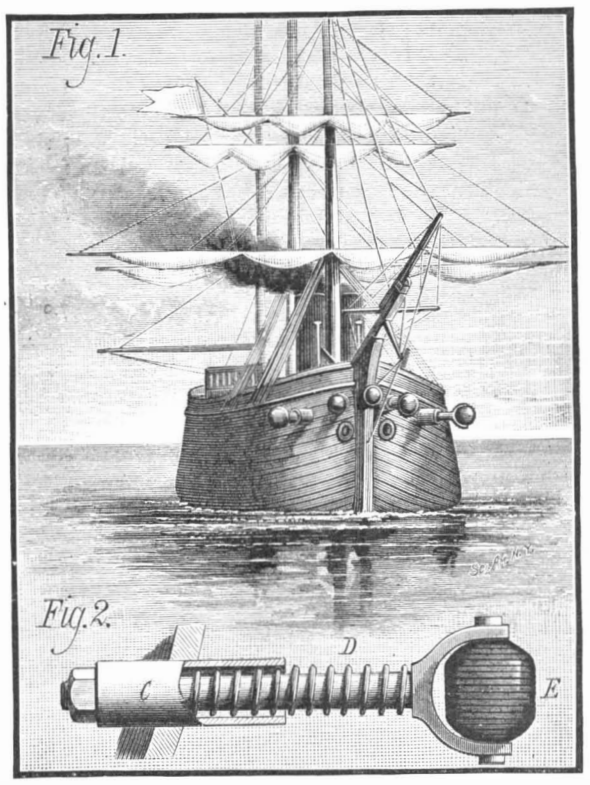
Gases of the Stomach.

In a paper recently read before the Paris Academy of Medicine, the author expressed the opinion that food does not produce gas, and that the gases which are found in the digestive tubes proceed from the external air, the blood and fecal matter; these gases are continually put in motion by the pathological contractions of the muscular fibers of the intestines; expelled by the mouth, they are constantly renewed, and their production may be as incessant in a starving man as in one who is well fed. This symptom of production of gas, therefore, signifies an irritation of the stomach, which is always consecutive to a long-standing gastric dyspepsia. No therapeutic agent need be sought to combat these gases.

A NEW FENDER FOR VESSELS.

The accompanying engraving represents a novel spring guard or fender for vessels, recently patented by Mr. Carl Hülster, of 181 Orchard street, New York.

The object of this invention is to furnish a device for attachment to vessels for deadening the shock or concussion in case of a collision, and thus preventing the damage which generally results from such accidents. The invention consists in several spring supported bars, D, projecting from the bow of the vessel, and carrying rollers, E, which are covered with tarred rope to give them a yielding surface. The bars, D, pass through strong iron sockets, C, secured to the timbers of the vessel. The inventor in the present case shows spiral springs around the bars, D, but rubber or other springs may be used, and they may be placed inside instead of outside of the vessel.



HULSTER'S FENDER FOR VESSELS.

In the event of the collision of two vessels the shock will be absorbed by the springs, so that neither of the vessels will be likely to sustain injury.

The Oldest and Coldest Town in the World.

According to Humboldt the oldest town in the world is Jakutsk, 5,000 inhabitants, in Eastern Siberia. It is not only the oldest but probably, also, the coldest. The ground remains always frozen to the depth of 300 feet, except in midsummer, when it thaws three feet at the surface. The mean temperature for the year is 13·7° F. For ten days in August the thermometer goes as high as 85°. From November to February the temperature remains between 42° and 68° below zero. The river Lena remains frozen for nine months of the year.

Anointing in Infantile Disorders.—Scarlet Fever.

More than twenty years ago a correspondent communicated to the SCIENTIFIC AMERICAN the following simple treatment for scarlet fever:

When the first symptoms of the disease appear anoint the flesh of the victim from head to foot with the inside of the rind or fatty portion of a smoked ham, and renew the application as often as the flesh becomes dry. The writer had saved his own children, and after our publication we received a number of letters from persons who had tried the simple remedy in their own families with satisfactory success.

We are reminded of the above by reading in a recent number of the *Lancet* the following testimony of H. Guard Knaggs, M.D., F.L.S., on the value of anointing in infantile disorders of various kinds, reporting a number of remarkable cases in support of his theory:

"During the past eleven months I have been testing, with uniformly successful results, the value of a very simple method of treating such infantile complaints as atrophy, bronchitis, convulsions, diarrhea, febrile disturbances generally, and indeed all disorders of childhood which are accompanied by an unnatural state of the skin.

"The treatment simply consists in smearing with salad oil the whole surface of the body, from the crown of the head to the tips of the fingers and toes, the process being repeated every twelve, six, or even four hours, according to the urgency of the case. Of course, the use of a long flannel gown or small blanket is obvious, and the fluid should be slightly warmed.

"The application of oil possesses the following immense advantages over the ordinary warm bath:

"1. Skin-action is more completely and permanently restored.

"2. The danger of reaction is avoided, for there is no sudden change of temperature; and, moreover, the sheet of oil protects the surface from atmospheric influences.

"3. It acts as a fuel-food, not only preventing waste of tissue, but actually increasing the bulk of the little patient.

"4. It does not depress, but, on the contrary, appears to exhilarate.

"It will scarcely be credited by many that the formidable affections above mentioned will frequently yield to this treatment, or, at any rate, show signs of abatement in from twenty minutes to four and twenty hours; but such is the case, though sometimes forty-eight or even seventy-two hours will elapse before any decided signs of improvement occur."

Useful Bacteria.

Hitherto much evil, and no perceptible good, has been attributed to the minute forms of vegetable life known as bacteria. It has been left for a Russian botanist, Cienkowski, to discover an instance of their usefulness, namely, in the manufacture of beet sugar. One of the necessary stages of the process is that in which the beet juice assumes a gelatinous consistency, when it is compared to frog spawn. The cause of this condition has had many explanations. Some have thought it due to the escaped viscid protoplasmic contents of the cells, others a result of a fermentation process, causing the sugar in the juice to become converted into a "spawny" cellulose and into glucose. Jubert and Mendes, however, suggested that it was owing to the presence of peculiar organized bodies, and this suggestion Cienkowski has now confirmed, showing by his researches carried on in a sugar factory that the "frog spawn" is, by its development and growth, closely related to a bacterian form described by Cohn as *Ascococcus Billrothii*, which he calls provisionally *A. mesenteroides*, and that to it the beet root sugar manufacturer is indebted for the formation of his glucose. This bacterian can be easily cultivated by keeping a slice of cooked beet root, a little moistened with water, in free contact with the air.

Cienkowski's monograph was published by the Imperial Academy of Sciences of St. Petersburg, last year.

Photography by Electric Light.

It has become quite the fashion in Paris for parties of ladies and gentlemen after dinner, or on their way to the opera, to step into a studio and have their photographs taken by the electric light. It is, moreover, said that the Americans are the best patrons of these night studios.

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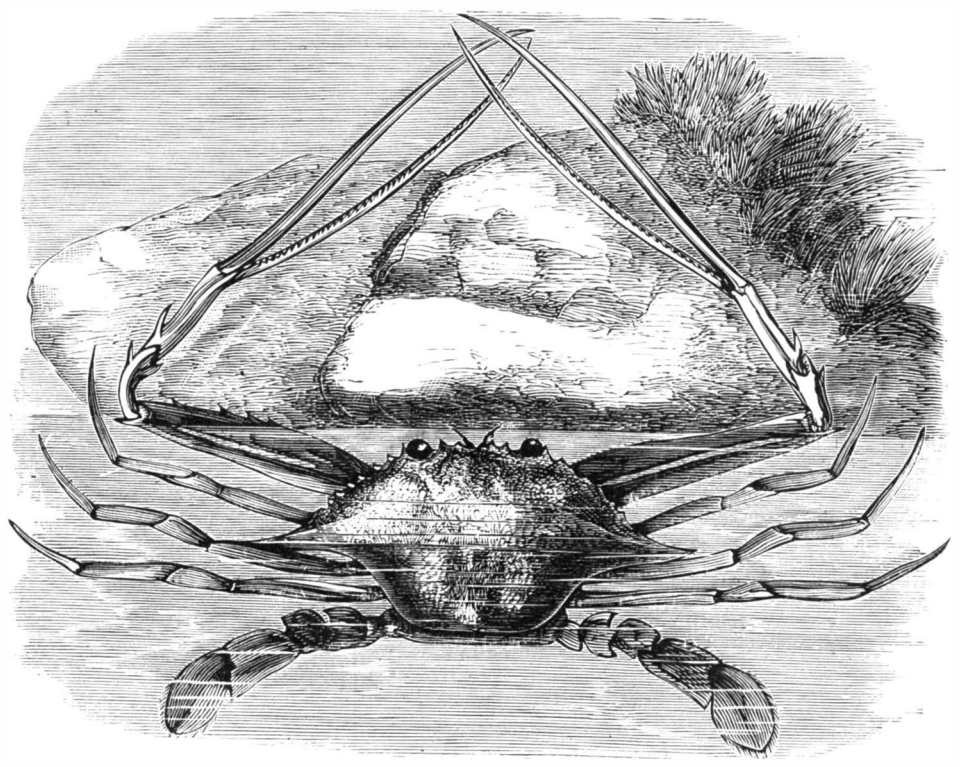
THE FORCEPS CRAB.

The strange looking creature represented in the accompanying engraving, says Wood's "Natural History," is a good swimmer. It roams the ocean as freely as a bird roams the air, shooting through the waves with arrowy swiftness in chase of prey, gliding easily along just below the surface, hanging suspended in the water while reposing, or occasionally lying across some floating seaweed.

The chief peculiarity of the forceps crab is the structure from which its name is derived, the wonderful length of the first pair of limbs, and the attenuated forceps with which they are armed. Though not possessing the formidable power with which some crabs are armed, the forceps crab is yet a terrible enemy to the inhabitants of the sea, for it can dart out its long claws with a rapidity that almost eludes the eye, and grasp its prey with unerring aim

No one who has not watched the crabs in their full vigor while enjoying their freedom, can form any conception of the many uses to which the claws are put. Their bony armor, with its powerful joints, appears to preclude all delicacy of touch or range of distinction, and yet the claws are to the crab what the proboscis is to the elephant. With these apparently inadequate members the crab can pick up the smallest object with perfection and precision, can tear in pieces the toughest animal substances, or crack the skull of other crustaceans as a parrot cracks a nut in his beak. It can direct them to almost every part of his body, can snap with them like the quick sharp bite of a wolf, or can strike with their edges as a boxer strikes with his fists. As may be seen by reference to the engraving the paddle legs are broad and well developed, so as to insure speed, the front of the carapace is sharply and deeply serrated, and the sides are drawn out into long pointed spines. It is a native of the West Indian seas, and is represented about the size of an ordinary specimen.



FORCEPS SWIMMING CRAB.—(*Lupa forceps.*)

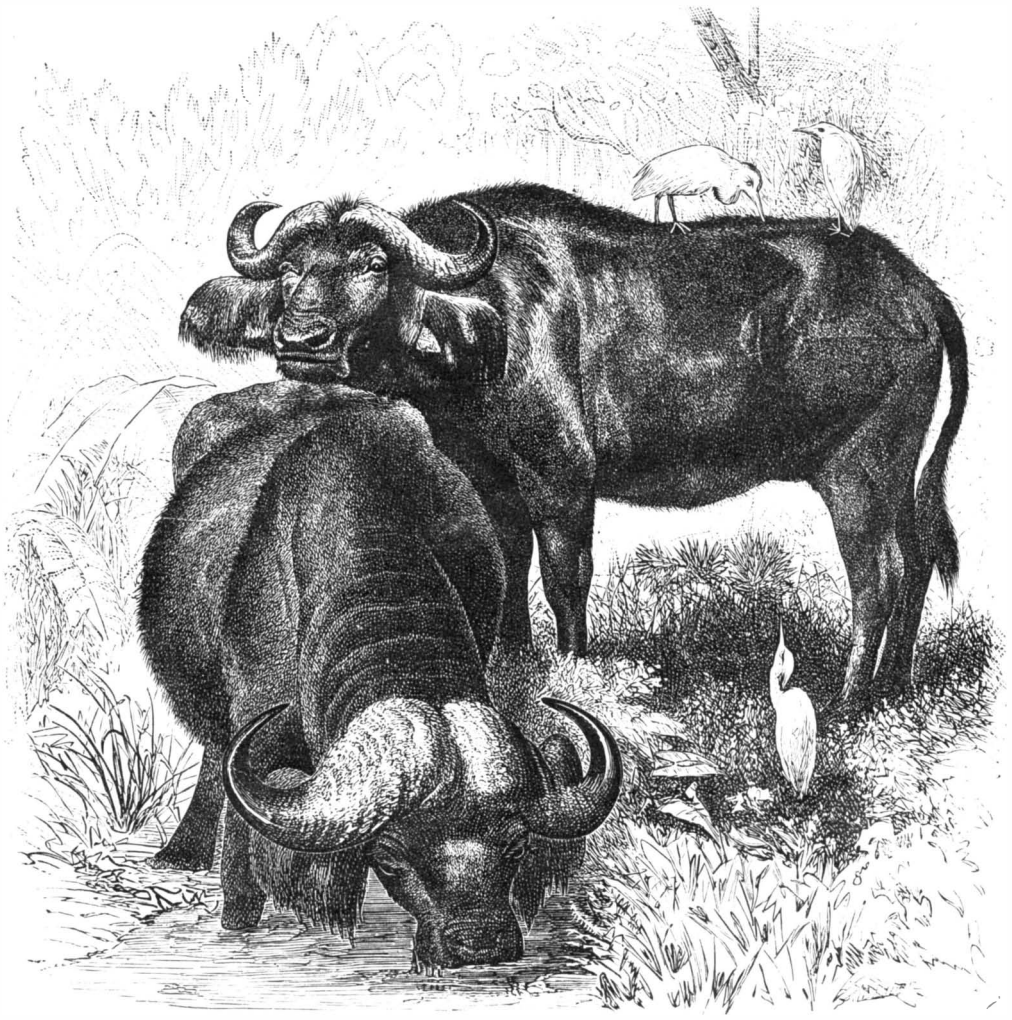
THE CAPE BUFFALO.

The Cape buffalo is a formidable animal, a little larger than an ordinary ox, but possessed of much greater strength. It is morose, lowering, and ill-tempered; terrible in outward aspect and a dangerous neighbor. It has an unpleasant habit of remaining quietly in its lair until the unsuspecting traveler passes close to its place of concealment, when it leaps suddenly upon him, filled with rage.

When it has succeeded in its attack it first tosses the unhappy victim in the air, then kneels upon his body in order to crush the life out of him, then butts at the corpse until it has given vent to its insane fury, and ends by licking the mangled limbs until it strips off the flesh with its rough tongue. Sometimes the animal is so recklessly furious in its unreasoning anger that it actually blinds itself by its heedless rush through formidable thorn bushes, which are so common in Southern Africa.

Although frequently found in large herds on the plains, the buffalo is principally a resident of the bush; here he follows the paths of the elephant or rhinoceros, or makes a road for himself. During the evening, night, and early morning he roams about the open country and gorges, but when the sun has risen high, or if he has cause for alarm, the glens and coverts are sought, and amidst their shady branches he enjoys repose.

The flesh of the Cape buffalo is not in great request even among the Kaffirs, who are in no wise particular as to their diet. The hide, however, is exceedingly valuable, being used for the manufacture of sundry leathern implements where great strength is required without much flexibility.



CAPE BUFFALO.—(*Bubalus Caffer.*)

A Canine Mind-Reader.

A very pretty illustration of that unconscious suggestion upon which the successes of "mind-reading," so called, have been based, is furnished by the performances of a clever dog belonging to the well known spectroscopist and astronomer, Dr. Huggins. This dog, a mastiff of noble proportions, to whom had been given the name of Kepler, possessed many rare gifts, which had secured for him the admiration and regard of a large number of scientific acquaintances; and among these was one which he was always ready to exercise for the entertainment of visitors. At the close of luncheon or dinner, says a writer in the *Edinburgh Review*, Kepler used to march gravely and sedately into the room, and set himself down at his master's feet. Dr. Huggins then propounded to him a series of arithmetical questions, which the dog invariably solved without a mistake. Square roots were extracted off-hand with the utmost readiness and promptness. If asked what was the square root of 9, Kepler replied by three barks; or, if the question were the square root of 16, by 4. Then various questions followed, in which more complicated processes were involved —such, for instance, as "add 7 to 8, divide the sum by 3, and multiply by 2." To such a question as that Keplergave more consideration, and sometimes hesitated in making up his mind as to where his barks ought finally to stop. Still, in the end, his decision was always right. The reward for each correct answer was a piece of cake, which was held before him during the exercise; but until the solution was arrived at Kepler never moved his eye from his master's face.

The instant the last bark was given he transferred his attention to the cake. Dr. Huggins was perfectly unconscious of suggesting the proper answer to the dog, but it is beyond all question that he did so. The wonderful fact is that Kepler had acquired the habit of reading in his master's eye or countenance some indication that was not known to Dr. Huggins himself. The case was one of the class which is distinguished by physiologists as that of expectant attention.

Dr. Huggins was himself engaged in working out mentally the various stages of his arithmetical processes as he propounded the numbers to Kepler, and being, therefore, aware of what the answer should be, expected the dog to cease barking when that number was reached, and that expectation suggested to his own brain the unconscious signal which was caught by the quick eye of the dog.

The instance is strictly analogous to the well known case in which a button, suspended from a thread and held by a finger near to the rim of a glass, strikes the hour of the day as it swings, and then stops—that is, provided the person who holds the button himself knows the hour! The explanation of this occurrence is that the hand which holds the button trembles in consequence of its constrained position, and in that way sets the button swinging, and as the attention of the experimenter is fixed upon the oscillation, in the expectation that a definite number of strokes upon the glass will occur, his own brain-convolutions take care that the movements of the finger shall be in accordance with that expectation.

The mathematical training of poor Kepler has, unfortunately, come to an untimely end. The interesting arithmetician died of an attack of typhus fever, to the great sorrow of his large circle of friends, at the beginning of last year, and he now sleeps under the shadow of the telescopes at Tulse Hill. The memory of his high attainments and of the distinguished success with which he upheld the reputation of his name, however, remains.

A Plea for the Crow.

A writer in the *Madras* (India) *Times* takes up the cudgel in behalf of crows. He thinks they are abused birds, and that they do a great deal more good than harm everywhere. Because they feed on dead animals he has heard the crows spoken of cynically as the carrion bird.

Then the writer concludes that when men express this disgust at them, they must forget their own partiality for stale venison or other strongly flavored game, old Stilton cheese, oysters that are eaten alive when eaten raw, and many other so-called delicacies. An animal will kill and eat to satisfy hunger. A man will eat merely for the pleasure of eating. A man will have a dozen kidneys for one breakfast; he will boil fish alive that it may retain its color; he will have it even cut up alive that its flavor may not be lost; he will have a calf killed in its infancy so that sweetbread may form a tasty diet on his table; he will have a dozen or more animals slain for one meal; even women draped in lace and tulle, looking more like angels or fairies than mortals, will just "try a little" *paté de fois gras* for their supper, never giving a thought to the cruel means by which the favorite luxury is obtained. Therefore, taking all things into consideration, the writer thinks that man is little better than the crows in the manner of satisfying hunger.

Tapeworm in Cucumbers.

The dietetic reputation of cucumbers is bad enough already, but it is likely to become worse, now that Dr. Leidy, of Philadelphia, has discovered that they are liable to be infested with tapeworm. At the Academy of Science, Philadelphia, he exhibited a tapeworm taken from the inside of a large cucumber. It is said to have had all the characteristics of a true tapeworm, but of an unknown species, the peculiarity being that the ovaries, containing the eggs, are confined to the anterior extremity of the segment.

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BETTER THAN DIME NOVELS.

It may seem a poor compliment to pay this excellent paper, but to me the Scientific American is more interesting than any dime novel. The truth is, however, that I have never read one, but have heard enough about them and seen enough of their effects to know something in regard to them. Trashy, sensational stories filled with incredible adventures of desperadoes who would think no more of taking a human life than killing a deer or buffalo, undermine the natural horror of such scenes.

The dissipated conduct of men and women in large cities is the basis of another class of stories still more injurious. By these exaggerated and rose-tinted tales many young persons have been drawn away from pursuits for which they were fitted, and almost or quite ruined. Not long ago I knew a boy of fourteen whose mind was so much injured by reading dime novels and story papers that he finally ran away to New Orleans and shipped for Liverpool. After a voyage there and back, realizing none of his pleasant dreams, but on the contrary enduring extreme hardships, he arrived at home with health and spirits much impaired.

Another boy did not run away and become a brigand, as he tried to, but read so many novels, in school and out, that although he was a bright lad he lost his place in class and became so restless that he could not work. Almost any day he could be found roaming through the woods, with a hatchet fastened inside his coat, a revolver in one pocket, and several yellow-covered novels in another. He even went so far as to write one, but never found a publisher.

A boy myself, sixteen years old, I enjoy reading the best scientific paper in the world, and recommend it to other lads for its large, clear type and important and interesting descriptions of new discoveries and inventions. When I first subscribed for the paper, four or five years ago, the articles and accounts in it were not as entertaining to me as they soon came to be, yet the day of its coming was looked forward to with eager expectation. Now I had rather give up any other paper than it.

Every week, as soon as it arrives, it is the first thing thought of as a means of profitably employihg an hour. On the title page is found a well executed engraving of some invention, or illustrating some manufacture of general interest. Within the paper we find numerous pictures of other inventions, with interesting descriptions of all; and in every number some topic of natural history is illustrated and described. Upon the first two or three pages are found editorials on various subjects, edifying and valuable to the general as well as the scientific reader. I have been very much interested in the discussion which is going on about the proposed change in the manner of obtaining and keeping patents, expecting some day, perhaps, to join the great army of inventors.

Looking on through its columns we find articles for every class of boys. Those interested in engineering and mechanics here find accounts of achievements in bridge building and road making, the relative values of different woods and metals as building materials, and new improvements in boiler making and ship building. For those who care for the natural sciences, articles are written concerning new combinations and discoveries in chemistry and physics. The accounts of the electric light are very curious and novel, as are also those of recent feats with the telescope and microscope. Boys who take an interest in the progress of our country will now see in your columns descriptions of various American industries, explaining the manner of making or preparing our many staple and fancy articles for the home and foreign markets. While for those who love flowers, horticulture is discussed in nearly every number, illustrated by pictures of new plants or fine specimens of an old variety.

Thus this paper is both interesting and instructive to all youth, and especially to those who care for the improvement of their minds and for increasing their stock of general information by the addition of valuable thoughts on a great many subjects. The railroad, telegraph, telephone, and all the other grand inventions which have made our nation so famous, are the heritage which will soon fall to the boys of America, and it would be well for them to be thinking what is to be done with it. No real knowledge of the world can be gained from dime novels and story papers. The Scientific American is just the paper for informing the boys of whatever of importance is taking place in the world, and for teaching them how to make use of their great inheritance.

E. O. H.

Self-Luminous Clock Dials.

[By Henry Morton, Ph.D., President of the Stevens Institute of Technology]

My attention having been drawn to the luminous clocks which have recently been offered for sale in several places, I made an analysis of the substance with which their dials are coated, and found it to consist of nothing but the well known phosphorescent compound, sulphide of calcium, attached by means of some resinous medium, like varnish. But while the material in its composition is far from novel, something or other in its method of manufacture and consequent condition gives it such intensity of properties as has never been approached before. The light given out by these clocks is a violet blue, like that which Becquerel produced with aragonite, but Becquerel makes no mention of anything whose duration of luminosity approaches that of these clock dials. In making up some of these preparations I have noticed that out of the same batch some portions will glow by phosphorescence much more brightly than others, so that evidently this difference depends upon some very small structural or molecular variation, and there can be little doubt that it is by some method of securing a desirable condition of this sort that the remarkable efficiency in these clock dials is attained. If still further advances should be made in this direction it is easy to imagine some very wonderful results, before which even Mr. Edison's new electric burner will fade into insignificance. Thus, if our walls were painted with such a substance, they would absorb light enough during the day to continue luminous all night, and thus render all sources of artificial light useless, superseding even the new electric burners, no matter how little they might cost, for it would then only be necessary to provide curtains, which could be drawn over the walls, like shades over windows, when darkness was desired. The coloring of houses on the outside with a like material would also evidently obviate the need of street lamps. I do not, like some of Mr. Edison's friends, in reference to his new electric burner, expect that this still more remarkable and economical source of light is certain very shortly to displace gas and all other sources of artificial illumination, but if conjectures are to be the order of the day, I do not see why this conjecture is not as good as many others which have been made. Seriously, this new form of the phosphorescent sulphide of calcium, made of the cheap materials, sulphur and lime, is a truly wonderful substance, which may well suggest strange possibilities for the future. In the cabinet of the Stevens Institute are numerous specimens of phosphorescent powders—sulphides of calcium, bar um, and strontium—which represent the best products heretofore obtained. These, if exposed to strong sunlight or to an electric discharge, or the like, will glow for many minutes in the dark. One of these clocks, however, I found would continue to glow with sufficient brightness to be visible across a room all night, and could be read at any time if approached closely. After being shut up in a box for five days, this clock was still visible in total darkness, when the eyes had been rendered sensitive by remaining in the dark for a few minutes. This clock dial is also readily "excited" by lamplight or gaslight, or indeed by any source of light containing rays above the yellow of the spectrum. The light from a Bunsen burner with soda in the flame, if filtered through yellow glass, will not excite it, however, but if the yellow glass is omitted, the blue rays of the Bunsen burner flame will serve to excite the phosphorescence of this remarkable material. The cause of this action is believed to be somewhat as follows: When light falls on certain bodies its vibrations cause molecular changes which are not permanent, but are only maintained by the action of the "exciting" vibrations, somewhat as a mass of plastic substance can be kept in a soft condition by constant stirring. When the exciting cause is removed, the molecules return to their normal positions, and in so doing, set up vibrations which are the cause of light, very much as the solidifying of water evolves heat. Thus these bodies, when exposed to daylight, absorb as it were the light energy, and re-emit the same afterwards. The phosphorescent property of sulphide of calcium has been known since 1768, when Canton prepared it by heating together intensely for an hour three parts of calcined oyster shells with one part of sulphur. Its properties in this relation have been elaborately studied by Becquerel, who published his researches in the "Annales de Chimie et de Physique," and has also devoted a large part of the first volume of his book, "La Lumiere," to this subject. He found that by employing lime in different forms, such as Iceland spar, marble, oyster shells, aragonite, etc., products emitting different colors by phosphorescence, such as orange, yellow, green, blue, and violet, were obtained.

Common Sense.

The *U. S. Economist* tells its readers that common sense is paradoxically an uncommon gift. It is symmetry of mind, of character, and of purpose in the individual combined. It represents man in completeness, harmony, and equipoise. It clothes him with dignity, invests him with power, and stamps him with superiority. That it is not genius, for that is often erratic; nor cunning, in its sinuous course; nor tact, with its decline into trickery. Common sense is the embodiment of true manhood. It confers a patent of royalty, though birth be plebeian, and exalts men from lowliest spheres to the highest stations. Not by sudden freaks of fortune or a train of adventitious circumstances are they thus dignified, but step by step, through obstacle and hinderance, they overcome by the force of character and the proper direction of the will power. Common sense is a tremendous force in this lower world. Its power is felt and acknowledged through all the ramifications of governments, society, business, finance, science, and commerce. In fact it is the history as well as the true philosophy of the ages. It is the salt that has saved humanity from barbarism, and the moving power that has propelled the race onward in its march of progress and civilization. Rulers who have possessed this gift have governed with moderation, firmness, and justice, and their reign has proved a blessing. Merchants upon whom this talent rested have worked their way up from narrow fields and small beginnings to circuits of trade as wide as the continents of the globe. It gave them the true conservatism needful to successfully accomplish their plans, and bestowed upon them the caution that kept them from too hazardous ventures. It has made more money kings than were ever crowned at lottery schemes, and gave bankers a wealth that speculation could never furnish. It is the only architect of abiding fortunes, and the true test of all financial skill. It promotes commerce, fosters trade, builds up industries, and is the conservator of public peace and morals. In the realm of business it produces no panics, in governments no disorder, and in society no tumults.

In individual characters marked differences are discernible. The weak, timid, and irresolute are in contrast with the strong, daring, and energetic. The voluble are full of conceit and bluster, the sensible, silent and uncommunicative. A man possessing common sense knows how to govern his tongue and let his acts speak instead of words. The most profuse talkers are generally those possessing the least brains, while words seasoned with wisdom fall from the lips of those who are silent until the occasion demands their utterance. The wise merchant keeps his own counsel, the skillful financier conceals his plans, and prudent men of business conduct their affairs in steady grooves that run without noise or friction. Common sense makes no parade, has no holiday attire, struts in no peacock plumes, and comes out in no sham display. It needs no aids to have its worth discovered, no outside support upon which to lean. It forms its own groundwork, erects its own superstructure, and builds after its own model. It is substance without shadow, success without failure, and victory without defeat. In the outcome it wins, when trickery, cunning, and tact have failed. It is generally allied with truth and honesty, and on all great moral questions is found on the right side. History is full of brilliant men who, like comets, have blazed awhile in glory and then through lack of sound wisdom made shipwreck of their lives. It is seldom safe to write autobiographies, as a man's character is not complete until his death. The men who have died in the midst of their labors, full of years and full of honors, are those who possessed the great gift of sound practical wisdom. Common sense is the philosophy of life in harmonious action.

Alleged New Preserving Agent.

In the course of a series of experiments made by Mr. H. Jannarch for devising a method of separating the crystallizable sugar from the molasses, a double salt of borate of potassium and sodium was accidentally formed, which exerted an antiseptic influence on the sugar. Further experiment showed this salt to be a most powerful antiseptic agent. It is now being made in larger quantities by dissolving in water equal quantities of chloride of potassium, nitrate of sodium and boric acid, and evaporating to dryness after filtering. The salt obtained is, of course, not a pure borate, but a mixture of potassio-nitric borate, potassium nitrate, and sodium chloride. Its action is very prompt and continues undiminished for a very long time. It has no injurious effect either as regards taste or smell or healthiness of the substances impregnated with it. It is easily soluble in water and quite deliquescent, so that it has to be kept in closely stoppered bottles. It is at present sold for 25 cents a pound.

In Germany it has been extensively used already by butchers, sausage makers, tanners, etc.; but its most important use is at present in the manufacture of butter and cheese from sweet milk. When butter is made from sweet milk in the ordinary manner, the milk must be kept very cold; when the "preserving salt," as it is called in Germany, is used, the milk may be kept at ordinary temperature without souring the remaining sweet milk may be worked up into a superior quality of cheese. If 15 grs. of the salt are added for each quart of milk, the latter will keep sweet for at least a week Fresh meat, game, etc., may be prepared by dipping it into a solution of 1 pound of the salt in 6 pints of water. When the meat is intended to be kept for a very long period, the meat is rubbed in well with the powdered salt in the proportion of 1½ drachm to each 2 pounds of meat. In twenty-four hours the impregnation is completed, and the meat only needs to be dried. A piece of meat prepared in this manner in January, 1877, was in perfectly good condition in January, 1879. For pickling the meat is prepared in the same manner and then placed between layers of a mixture of 2 lb. of common salt, ½ lb. preserving salt, and ¼ lb. of sugar. In this way the largest hams can be salted in four days. For preserving skins, from ½ to 2 lb. are used, according to size. Eggs are placed for 15 minutes into a solution of 1 oz. of the salt in a quart of water. To preserve beer, wine, etc., it is sufficient to rinse the bottles, previous to filling them, with a solution of the salt in the proportion of 1 : 10, and adding to the beverage itself 8 grs. per quart. For fish, lobsters, oysters, fruit, and vegetables the preparation has also been used with the best success.—*Deutsche Gewerbe-Zeitung.*

The Origin of Existing Floras.

In a report to the Royal Society, Baron Ettinghausen says that all the existing floras of the earth are the descendants of the plants which constitute the Tertiary flora. The Tertiary strata contain the original species of the recent floras and plant forms of all parts of the globe. Moreover, in each of the recent floras are to be perceived the elements of their common origin. They have, nowever, been more or less changed, and have developed into manifold forms. The fossil plants, according to the Baron, vary more than the living ones, the varieties of the fossil plants corresponding with what are now regarded as species. The varieties, for instance, of the fossil pine, called *Pinus palæostrobus*, so entirely correspond with many of the recent species of *Pinus*, that the former must be regarded as the original forms of the latter. The Eocene flora of Great Britain, to which the author has given special attention, is remarkable for a series of ferns of tropical character. These have been discovered at Bournemouth, Bovey Tracey, and elsewhere.

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Vibrations of the Plate of a Bell Telephone.

Experiments have been made by M. Henri Dufour to determine the vibrations of this plate. The first method employed consisted in transmitting the vibrations to a gas flame. For this purpose the wide-mouthed bell of the telephone was replaced by a cylindrical one of small capacity. A cork, pierced with two holes through which passed two kneed tubes of glass, bounded within the cylinder a sort of little chamber comprised between the front face of the vibrating plate and the hind face of the cork. The illuminating gas entered through the first tube, and issued, forming a small flame, at the extremity of the tapering second tube, so that the whole constituted something analogous to the manometric capsules which M. König places upon the pipes. Every vibration of the plate was betrayed by a movement of the flame when the induced currents employed were those produced by a small Dubois-Reymond coil, even when the exterior coil was at two centimeters from the extremity of the inducing coil. The currents produced by the voice in a second telephone caused no variation in the height of the flame. The result was equally negative when a small mirror was borne on a kneed lever with its end resting on the vibrating plate. A ray of light reflected by the mirror did not appear to be displaced under the influence of the vibrations produced by the voice. Finally, M. Dufour tried to produce colored rings between the vibrating plate and a lens placed upon it. For this a very thin piece of glass was placed upon the vibrating plate, in contact with the slightly convex lower face of a lens. The sounds were transmitted by the instrument, although weakened. The colored rings were observed through a telescope furnished with a reticule. The displacement of a bright ring to the following dark one was produced by a difference in the thickness of the stratum of air equal to a quarter of a wave-length; that is to say, a change in the position of a yellow ring will be ascertained for about 0 000143 millim. displacement of the plate. This displacement is manifested by a diminution in the distinctness of the rings, which oscillate about their normal position. The displacements are observed very distinctly by employing the induced currents of a Dubois-Reymond coil, but it has not been possible to verify them for the currents produced by the voice.

Having heard it said that two telephones, the localities of which have very different temperatures, do not work well, the author desired to put the matter to the test by direct experiment. One of the instruments was left during several hours exposed to a temperature of — 18°, while the other passed the same time in an inclosure heated to 40° C. The two instruments put in communication transmitted speech perfectly. As soon as the telephone was employed on the telegraph lines the action was remarked which is exerted upon the instrument by the currents used to work the Morse apparatus, and passing in wires near that which connects the two telephones. This action is attributable to induction phenomenon. M. Dufour tried to ascertain the distance at which an intermittent current can produce an appreciable current in the telephone. Two copper wires, perfectly insulated, were stretched parallel over a length of 15·2 meters, and at distances varying between 15, 35, and 45 centimeters. One of the wires joined the battery and the manipulator with the receiver of a Morse apparatus; the earth line was formed by the gas pipes. The two extremities of the other wire communicated directly with the telephone. The current employed produced a deflection of 60° on a telegraph needle. Under these conditions all the motions of the manipulator were distinctly perceived, and the author is persuaded that a telegraphist would have understood the signs produced by the manipulator, even when the distance between the two wires was 45 centimeters. It may hence be concluded, therefore, that on telegraph lines the noise heard in the telephone when a message traverses a neighboring wire may be attributed, at least in part, to induced currents.

This experiment may have a certain interest in the lecture room, to show at what distance an induced current can be produced. In this respect the telephone is much more sensitive than the galvanometer.—*Electricien.*

Ground Honey.

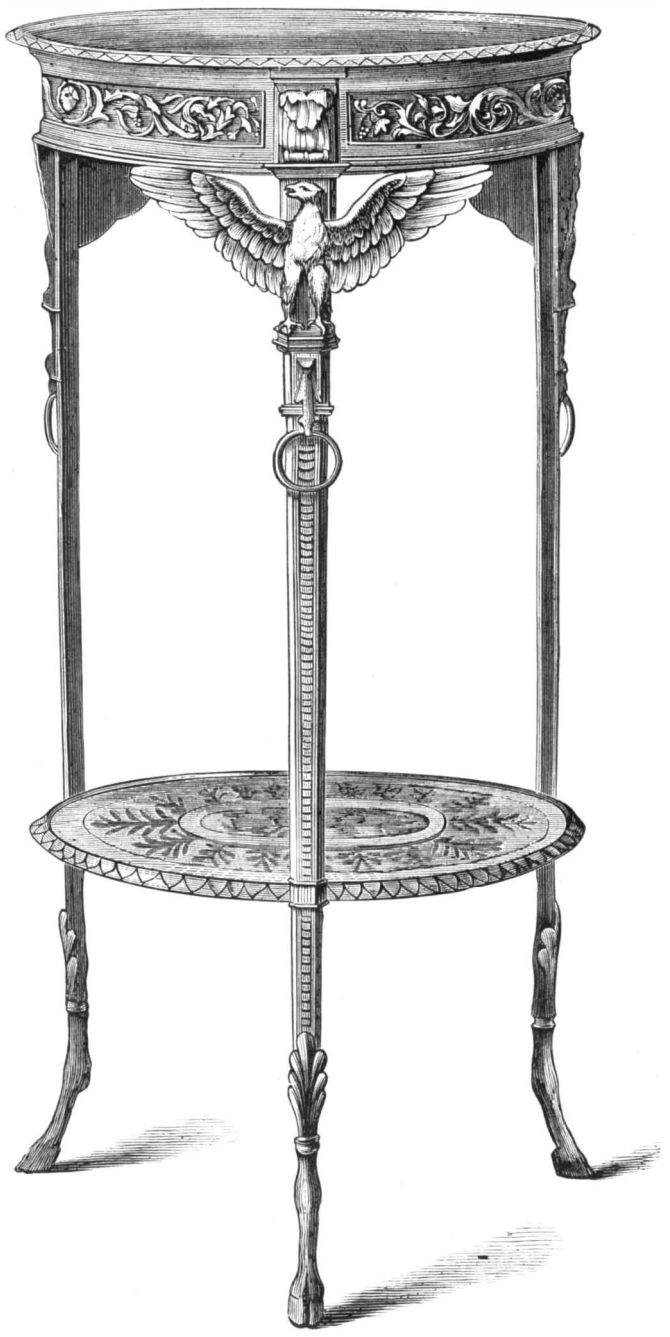
M. Pierre Arnoux, lately traveling in Abyssinia, discovered in small cavities in the soil a species of honey without wax, produced by an insect resembling a large gnat. Examined by M. Vielliers, this ground honey was found to have the following composition: Water, 25·5; fermentable sugar, 32; mannite, 3; dextrine, 27·9; ashes, 2·5; diverse matters, 9·1; total, 100. The undetermined matter contained a small proportion of some acid principle, the nature of which M. Vielliers had not been able to make out. The composition of this honey resembles that of the manna of Sinai and Kurdistan, formerly analyzed by M. Berthelot, that of the sugar found in the leaves of the plane tree by M. Boussingault, as well as that of ordinary honey. It is, however, distinguished from all those substances by the total absence of cane sugar. In Abyssinia this substance is collected by the natives, and used as a remedy for affections of the throat.

Morning Mirage.

A characteristic phenomenon in Dakota is the morning mirage, seen on the prairies just before sunrise in clear, cold, still weather. At such times wide reaches of country ordinarily cut off from the view by rising ground or belts of timber will be raised, as it were, above these obstacles. Towns and other prominent objects, 20 miles away, are no longer invisible, but are clearly revealed, with all that lies between them and the spectator. The windows may be counted in houses which at other times can no more be seen than if they were at the antipodes, and near objects, usually just within the range of vision, seem to be brought much closer. As the sun's orb rises above the horizon the vision sinks below it.

FINE CAST IRON WORK.

The annexed engraving shows a specimen of iron castings for a table. It has many details of ornament, and exhibits the application of the best style of modern art to such decorative objects.



ORNAMENTAL CAST IRON TABLE.

The design is founded upon classical types adapted to Renaissance ornament. This specimen is from a series of designs carried out in metal by the firm of E. G. Zimmermann, of Hanau (Hesse Nassau).

Preventing Seasickness.

Of the many annoyances to which the traveling public is subject at this particular season, seasickness is, perhaps, the most distressing. A perfect cure for this malady would rob ocean travel of half its terrors. No drug, however, has been discovered which acts as a specific. The cause of the sickness is largely, if not wholly, due to the involuntary and unexpected motions to which the passenger is subjected on board ship. These cause undue pressure upon the stomach and liver, and derange the action of those organs. To prevent this, attention has recently been called to an old plan, which is said to be very successful. It consists in regulating the act of breathing according to the pitching or rolling of the vessel, drawing in the breath as she rises, and breathing out as she falls into the trough of the waves. After a little experience the practice, it is said, becomes involuntary. When seasickness has fairly set it, the only thing to be done is to get rid of the extra bile thrown into the circulation, and to allay the irritation of the stomach. For the latter, brandy is the popular remedy, but cool, effervescing drinks are preferable. Champagne is recommended as the best medicine to subdue nausea, and give the necessary tone to the system.

The Argan Tree.

In his account of his recent travels in North Africa, Sir Joseph Hooker, the eminent English botanist, describes the argan tree as in many respects the most remarkable plant of South Morocco; and it attracts the more attention as it is the only tree that commonly attains a large size, and forms a conspicuous feature of the landscape in the low country near the coast. In structure and properties it is nearly allied to the tropical genus *Sideroxylon* (ironwood); but there is enough of general resemblance, both in its mode of growth and its economic uses, to the familiar olive tree of the Mediterranean region to make it the local representative of that plant. Its home is the sub-littoral zone of Southwestern Morocco, where it is common between the rivers Tensift and Sous. A few scattered trees only are said to be found north of the Tensift; but it seems to be not infrequent in the hilly district between the Sous and the river of Oued Noun, making the total length of its area about 200 miles. Extending from near the coast for a distance of 30 or 40 miles inland, it is absolutely unknown elsewhere in the world. The trunk always divides at a height of 8 or 10 feet from the ground, and sends out numerous spreading, nearly horizontal branches. The growth is apparently very slow, and the trees that attain a girth of 12 to 15 feet are probably of great antiquity. The minor branches and young shoots are beset with stiff thick spines, and the leaves are like those of the olive in shape, but of a fuller green, somewhat paler on the underside. Unlike the olive, the wood is of extreme hardness, and seemingly indestructible by insects. The fruit, much like a large olive in appearance, but varying much in size and shape, is greedily devoured by goats, sheep, camels, and cows, but refused by horses and mules; its hard kernel furnishes the oil which replaces that of the olive in the cookery of South Morocco, and is so unpleasant to the unaccustomed palate of Europeans. The argan averages about 25 feet in height, and covers a space of 60 or 70 feet in diameter. Sometimes goats were seen feeding on the fruit, much to the amusement of Sir Joseph, who had not been accustomed to consider the goat as an arboreal quadruped. Owing to the spreading habit of the branches, which in the older trees approach very near to the ground, no young seedlings are seen where the trees are near together, and but little vegetation, excepting small annuals; but in open places, and on the outer skirts of the forest, there grows in abundance a peculiar species of thyme (*T. Broussonnetii*), with broadly ovate leaves and bracts that are colored red or purple, and the characteristic strong scent of that tribe. It is interesting to the botanist as an endemic species, occupying almost exactly the same geographical area as the argan. It is replaced in the interior of the country by an allied, but quite distinct, species. Its penetrating odor seems to be noxious to moths, as the dried twigs and leaves are much used in Mogador, and found effectual for the preservation of woolen stuffs.

The First Experiences of the Japanese with Statical Electricity.

The following is from Mr. E. Clark's "Life and Adventure in Japan." The author lived in Japan from 1871 to 1875, and was in the service of the Japanese Government. He describes the Japanese as being very fond of anything practical, and as being delighted with anything in the shape of experiment, even, apparently, when practiced upon themselves: "I never witnessed a more ludicrous sight than the effects produced upon the Japanese by some of my experiments. The innocent manner in which they stepped up to the various electric machines, and did whatever they were told, was only excelled by the dumb astonishment or the frantic yell with which they received the electric shock. No visible effect, however great, upon the first who wanted to take hold was sufficient to restrain the intense curiosity of those who wished to follow. They wanted to feel for themselves, and their ambition was usually satisfied after one trial. Two of the governors took a 'spark' from one of the machines, but the third was very dignified, and would not deign to come up to the table, as it was contrary to strict etiquette. So I politely offered to bring him some electricity in a bottle. He doubted whether that could be done. In order to dispel his doubts, and also to bring him down to the level of ordinary mortals, I took a large Leyden jar, which I charged full of electricity, and brought it to him with good grace. He looked at the jar, and seeing nothing in it, concluded to touch the brass knob at the top. The effect may be better imagined than described, only he didn't show any more dignity or touch any more jars that day."

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PROTECTING POLISHED IRON SURFACES.—A correspondent states that a varnish, consisting of beeswax dissolved in benzine, is an excellent protector for polished iron surfaces. It is also a good varnish for patterns.

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WHAT SHOULD BE THE LEGAL STANDARD OF KEROSENE?

There are two widely prevalent errors in regard to the use of kerosene. One is that kerosene explosions are always the result of carelessness; the other, that the use of kerosene is necessarily attended with more danger than accompanies the use of animal or vegetable oils; in other words, that it is impossible to make an illuminating oil from petroleum which will not be more or less risky under ordinary household conditions. Both these errors are due to popular ignorance with regard to the nature and properties of the mixture of petroleum products properly denominated kerosene, and the conditions under which low grade or adulterated kerosenes explode.

Crude petroleum, from the complexity of its composition, has been aptly compared to a book; the products given off at successive temperatures being the leaves, each showing more or less pronounced characteristics. Its more volatile parts are given off at a temperature as low as the freezing point of water. At summer heat appears rhigoline, which boils at 65° Fah.; at temperatures below 170°, gasoline is given off; and between that and 300°, the product is called naphtha. The naphtha distilled at a temperature above 280° is distinguished as benzine. All these products are without oily properties; are volatile at common temperatures; take fire readily, and, when their vapors are mixed with from seven to nine times their volume of air, they burn with an explosion, even when not confined.

Between 300° and 400° kerosene is distilled, a mixture of products ranging in character between benzine and the heavy paraffine oils, too thick for use in lamps. According to Professor Chandler, 100 parts of crude petroleum yield, by distillation, 1½ parts of gasoline, 10 of refined naphtha, 4 of benzine, 55 of kerosene, 17½ of paraffine (lubricating) oil, 2 of paraffine, and 10 of coke, gas, and loss. Benzine is worth about half as much as kerosene; naphtha and paraffine oil about one third as much.

The temptation of refiners of petroleum is to mix their oils with the lighter and cheaper naphthas, then bring up the product to the appearance of kerosene by an admixture of paraffine oil, also lower in price than pure kerosene. It is the naphtha, with its low flashing point, that causes all the mischief.

The legal standard for kerosene in this and many other States is 100° fire test; the United States standard is 110°. In Michigan all oils are forbidden which flash at 140° or below. Obviously if the law is enforced in the last named State, kerosene accidents are quite impossible there.

An effort is being made in Boston to have the standard raised from 100° to 110°; some insist that it should be made as high as 135°. Professor Chandler, President of the Board of Health of this city, asserts that the standard of 135° should be adopted everywhere; in which case there would be an end of kerosene explosions, provided, of course, that the law be rigidly enforced. Should the standard be so raised, the actual cost of the oil, he says, would not be increased more than a cent or two a gallon.

In his report on illuminating oils, for the Colorado Board of Health, Dr. Ambrook says that he found it possible to distill a fairly safe oil at 300°, standing a fire test of 132°; but the process was too slow and costly for commercial purposes. This would seem to indicate that for domestic uses only those products evolved at temperatures, say, between 325° and 400°, should be tolerated, and these only without admixture with lighter or heavier products. In his examination of the oils to be found in the shops in Colorado, Dr. Ambrook found that nine-tenths of the samples gave off on an ordinary summer day, such quantities of inflammable vapors that a lighted match applied to the mouth of an open lamp would cause an explosion. Some samples were composed entirely of naphtha and paraffine; others flashed 55° below the fire test guaranteed. It is needless to add that such fraudulent and highly dangerous mixtures are probably not confined to the Colorado market. It is perhaps also needless to add that while carelessness may enhance the danger attending the use of such oils, they cannot be safe even with the most careful handling. On the other hand, an honest kerosene, with a high flashing point, is as safe an illuminating material as the world has ever known.

THE AILANTHUS AS TIMBER.

The *American Agriculturist*, in an article on that much abused tree, the ailanthus, gives the following information in regard to its great value as timber, taken from a paper on the subject by Prof. C. S. Sargent. In experiments made in the French dockyard at Toulon, where the wood of this tree was tested as to its tenacity, or ability to resist a strain, in comparison with the timber of European elm and oak, an average of seven trials showed that the ailanthus broke with a weight of 72,186 pounds, while the elm in a similar number of trials yielded to 54,707 pounds, and the oak, in the average of ten specimens, broke under a weight of 43,434 pounds. Evidence as to the value of ailanthus timber in exposed situations and as to its durability when set in the ground is yet meager, but the little that we have is favorable. Of its value for interior work and for cabinetmaking there can be no doubt, the wood possessing properties remarkable in so rapid-growing a tree. The wood is at first of a pale straw color, but grows somewhat darker with age, and takes a high polish.

When cut to show the silver grain it presents a satiny luster that is very pleasing, and as regards freedom from warping and shrinking it is superior to walnut and fully equal to mahogany. It is said to cut up economically, seasons readily, is easily worked, is free from unpleasant odor, and has no ill effects on the tools. For the treads of stairs, the floors of offices, mills, and other buildings, where constant use requires a hard, strong wood, it is probably superior to any of the woods commonly employed in such situations. There is one use for which its freedom from tendency to shrink will especially commend it—*i. e.*, interior finishings. Its warm color will make it very effective, when used with both lighter and darker woods. It is a fashion now, more than formerly, to use wainscotings in houses. The ease with which ailanthus timber may be produced will allow those who live where other woods are not obtainable, to adopt this style of interior finish.

The tree grows very rapidly when young, but later its increase in diameter is slow. One of the oldest, if not the oldest, in the country, now 60 years old, has a girth of 9 feet 4 inches. According to observations it appears that the ailanthus grows about as rapidly in a poor soil as in a rich one—a matter of considerable importance to tree planters. It will even grow in blowing sands and on the sea coast, localities where few trees can live. In addition to its usefulness as timber its wood has a higher value as fuel than most of those in general use for burning. The tree is very easily propagated, and, indeed, in cultivated grounds, where for the most part it would be out of place, it propagates from seeds most too easily; the seeds, having a broad wing, are carried to a distance by the wind, and the young plants come up in all sorts of unwelcome places. The northern limit at which the ailanthus will prove hardy is not settled, but Prof. Sargent thinks that a line from Boston to St. Louis will about indicate its northern boundary. He, no doubt, intended to say isothermal line, as the tree is known to be hardy as far north as Michigan.

Hotbeds.

The *Irish Farmers' Gazette* (Dublin) says: If gardeners and others will give a trial to the following plan they will find it less than one fourth the expense of glass frames, and much more useful:

Take white cotton cloth of a close texture, stretch it, and nail it on frames of any size you wish; mix 2 ounces of lime water, 4 ounces of linseed oil, 1 ounce of white of eggs separately, 2 ounces of yolk of eggs; mix the lime and oil with a very gentle heat, beat the eggs separately and mix with the former. Spread the mixture with a paint brush on the cloth, allowing each coat to dry before applying another, until they become waterproof.

The following are some of the advantages these shades possess over glass:

1st.—The cost being hardly one fourth.

2d.—Repairs are cheaply and easily made.

3d.—They are light, they do not require watering; no matter how intense the heat of the sun, the plants are never struck down, faded, or checked in growth, neither do they grow up long, sickly, and weakly, as they do under glass, and still there is abundance of light. The heat entirely arises from below, and is equable and temperate, which is a great object. The vapor arises from the manure and earth, and is condensed by the cool air passing under the surface of the shade, and hangs in drops upon the inside, therefore the plants do not require so frequent watering. If the frames or stretchers are made large they should be intersected with crossbars, about a foot square, to support the cloth. These frames are also well adapted for bringing forward flowers in season. For forcing melons, tomatoes, vegetables, etc., this prepared cloth is especially adapted, as it can be attached to boxes of any size and cut to fit them. Little, though square, boxes of the proper size and height, covered with this prepared cloth, can be placed over the beds in which roots and seeds are planted, and the plants allowed to stand without transplanting until all danger of frost is over, when the boxes may be taken off and placed carefully away for another season.

A Fern Valley.

There is a wide field before the enthusiastic lover of nature for the indulgence of a passion for fern culture, if considerations of cost do not stand in the way. What, for instance, could be more delightful, where the necessary expenditure could be freely undertaken, than the creation under glass of a fern valley? Given a natural valley or gorge between parallel hills, and why might not the space from hill to hill be roofed with crystal, the roof supported at each end with pillars of stone, with glass between? Under such a covering, even if the natural features of the site were not of a nature to provide a home for ferns, masses of rock and a stream of water could be introduced, and, by a proper regulation of the temperature, the most delicate and beautiful as well as the most noble of the cryptogamic growths of the tropics would flourish, and a little fern world of wondrous beauty might be created. On the estates of the wealthy in numerous parts of these islands there is many a rocky glen or valley where the experiment could be tried. If through the course of such a valley, to be thus domed with glass, a natural stream wound its way, on each side tree ferns could be planted. On its margins the larger species of herbaceous ferns might be gathered, and so disposed as almost to hide the streamlet's course under a wealth of glorious fronds. Massed up rocks, too, on each side of a rude pathway, running parallel with the watercourse on each margin, might afford a congenial home for the rock-loving members of the flowerless family. On each hillside above the streamlet many a broad platform of earth or rock would afford space for creeping brake or clustering polypody, while on many a craggy point and in many a moist and sheltered nook, congenial habitats might be found for the fern of the open cliff and the dripping cave. In such a glen or valley, with a climate of moisture and heat, the ferns of the tropics, forgetting that they were no longer in the humid depths of primeval forests, would unroll their great glossy fronds, and rise to a height unknown without the limits of their extemporized world. The maidenhair would no longer miss the air of the sea coast, and the glossy-fronded *Asplenium marinum* would develop as grandly as it could in its wild and dripping rocky cavern.—*Fern World.*

Coniferine and Vanilline.

Less than twenty years ago Hartig discovered the glucoside, called coniferine, in the descending sap of *Larix Europæa*, and its presence has since been detected in all pines and firs submitted to examination. But the importance of the discovery has only become apparent since it was found by Tiemann and Haarmann, in 1874, that coniferine might be readily transformed into a kind of acid called vanilline, identical in composition with the white odoriferous substance in vanilla pods. Thus the sweet-smelling product of the vanilla, the fruit of a tropical orchid, can, by this wonderful discovery of modern chemistry, be manufactured from the sap of the coniferous trees of our own climate. During the last two years coniferine has been collected in North Germany by hundreds of pounds. The process of manufacture is as follows: When the various kinds of coniferous trees are cut down for the sake of their resinous products, etc., in spring or at the commencement of summer, the trunks are sawn across, the bark stripped from them, and the sap scraped from the surface of the wood by means of a large blunt knife. The product thus obtained is at once placed over a fire and heated to a boiling point in order to coagulate the albuminous substances, and thus clarify the fluid, which is reduced by evaporation to about one fifth of its original bulk. By being then left to itself in the cold it gradually deposits crystals of coniferine, while the mother-liquor of these crystals retains certain saccharine products, the chief of which is the curious variety of sugar known by the name of pinite. The price of the product varies from $12 to $16 per kilogramme (2¼ lb.); and as the operation of collection and preparation can be easily and economically performed by women, this industry will add another source of income to the forest population of Germany. A tree of medium size, in vigorous health, is said to yield from seven to nine pints of sap, and each pint of sap contains about 100 to 125 grains of pure dry coniferine.

Vanilline is obtained from coniferine by heating the latter with sulphuric acid and bichromate of potash, and then distilling the mixture. By washing the product with ether (in which the vanilline is soluble), and subsequently evaporating the ether, the odoriferous substance is obtained in the form of star-like crystals. The sodium salt of vanilline acted on by anhydrous acetic acid yields a body like coumarine—the odoriferous principle of the Tonka bean—and which boiled with caustic potash is converted into ferulic acid—the acid obtained from assafœtida; so that by careless or improper manipulation, instead of the sweet-scented vanilla a product far from odoriferous might be obtained.

Immigration in 1878.

The Chief of the Bureau of Statistics reports that during the calendar year 1878, the number of immigrants arriving at the several ports of the United States was 153,207, an increase of about 17 per cent over 1877. The occupations of the immigrants of 1878 were as follows:

Professional, 1,516; skilled, 16,837; not specified, 631; without occupation (mainly women and children), 72,121. The countries of last permanent residence or citizenship were as follows: England, 19,581; Ireland, 17,113; Scotland, 3,700; Wales, 311; Germany, 31,958; Austria, 4,881; Hungary, 632; Sweden, 6,176; Norway, 5,216; Denmark, 2,688; Netherlands, 652; Belgium, 454; Switzerland, 2,051; France, 4,668; Italy, 5,163; Greece, 13; Spain, 432; Portugal, 648; Russia, 4,216; Poland, 554; Turkey in Europe, 23; Syria, 38; India, 9; China, 8,468; South Africa, 7; Africa (not specified), 4; Quebec and Ontario, 24,533; Scotia, 3,282; New Brunswick, 1,458; Azores, 873; Iceland, 168; Australia, 634; and the rest scattering.

The large proportion of skilled laborers among the male immigrants is very encouraging. The indications are that during future years a still larger increase of national wealth will accrue from the same source.

Defeat of the Patent Bill.

We are not familiar with the patent laws, nor are we well enough acquainted with the subject to say what should or should not be law so far as the rights of inventors are concerned, says the editor of the *Hudson River Chronicle*, but we have watched with admiration the pertinacity with which the SCIENTIFIC AMERICAN has combated, in the interest of inventors, the late attempt of the appropriators of other men's brains to obtain Congressional sanction for their stealings. We happen to know that hardly one inventor in a thousand ever obtains a fair equivalent for his nights and days of toil, but it seems to us that the one in a thousand is indebted to the SCIENTIFIC AMERICAN that even he is saved, for under the bill proposed there was not a living chance even for one in a thousand to escape being stolen out of his boots.

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Valves and Hydrants, warranted to give perfect satisfaction. Chapman Valve Manuf. Co., Boston, Mass.

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The SCIENTIFIC AMERICAN Export Edition is published monthly, about the 15th of each month. Every number comprises most of the plates of the four preceding weekly numbers of the SCIENTIFIC AMERICAN, with other appropriate contents, business announcements, etc. It forms a large and splendid periodical of nearly one hundred quarto pages, each number illustrated with about one hundred engravings. It is a complete record of American progress in the arts.

NEW BOOKS AND PUBLICATIONS.

NINTH ANNUAL REPORT OF THE STATE BOARD OF HEALTH OF MASSACHUSETTS. 1878. Boston: Rand, Avery & Co., printers.

The Massachusetts State Board of Health justly ranks as the model institution of the kind in the country. Its reports are always valuable. Among those of 1878, three or four are of general as well as permanent interest; namely, Drainage and Health; Dangers from Color Blindness; The Filtration of Potable Water; School Sanitation; Scarlet Fever.

REPORTS ON THE PHILADELPHIA INTERNATIONAL EXHIBITION OF 1876. Vol. III. London: printed for the Government. 1878. Price 5s.

Vol. III. of the British reports on the Centennial Exhibition contains a list of awards to British and Colonial exhibitors, with the specific recommendations by the judges on which the awards were based: General reports on groups 1, 6, 8, 9, 11, 12, 13, 18, 20, 21, and 25; and the report of the director of the Bureau of Medical Service. These volumes contain a vast amount of matter of permanent scientific and industrial interest.

VAN NOSTRAND'S SCIENCE SERIES: New York: D. Van Nostrand, 1879.

The recent numbers of this useful series are No. 40, The Transmission of Power by Compressed Air, by Robert Zahner, M.E.; No. 41, The Strength of Materials, by William Kent, M.E.; and No. 42, Voussoir Arches applied to Stone Bridges, Tunnels, Domes, and Ground Arches, by William Cain, C.E. Price of each 50 cents.

AMERICAN ALMANAC FOR 1879. Edited by A. R. Spofford, Librarian of Congress. New York: American News Co., 12mo., pp. 420. Price $1.50.

This, the second issue of Mr. Spofford's valuable and convenient treasury of facts, is fully equal to its predecessor. The index covers ten closely printed columns, and refers mainly to skillfully tabulated statements of statistical, financial, and political facts of general and timely interest. Only those who do not read the newspapers will find it easy to do without it.

A POPULAR TREATISE ON THE CURRENCY QUESTION: written from a Southern point of view. By Robert W. Hughes, U. S. Judge of the Eastern District of Virginia. New York: G. P. Putnam's Sons.

An able argument against inflation and in favor of the national banking system. Judge Hughes is a bimetallist, but wants a silver dollar to be all that it pretends to be—a full dollar; and holds that gold and silver have demonstrated their title to be the only material for money by successful competition with all other materials.

HOW TO READ, AND HINTS IN CHOOSING THE BEST BOOKS. By Amelia V. Petit. New York: S. R. Wells & Co.

A book likely to be useful to young readers with unformed critical taste, who wish to read wisely but lack knowledge and experienced guidance.

A POCKET BOOK FOR CHEMISTS, CHEMICAL MANUFACTURERS, METALLURGISTS, DYERS, DISTILLERS, BREWERS, SUGAR REFINERS, PHOTOGRAPHERS, STUDENTS, ETC. By Thomas Bayley. New York E. & F. N. Spon.

Well packed with information of use to chemists, and fairly well indexed. Rather too ambitious and comprehensive for a pocket book, but all the better for a handy book of reference for the student's or the working chemist's table.

THE DESIGN GENERALLY OF IRON BRIDGES OF VERY LARGE SPAN FOR RAILWAY TRAFFIC. By T. C. Clarke, M. Inst. C.E. Edited by the Secretary of the Inst., James Forrest, London: Wm. Clownes & Son.

The Telford prize paper (with discussion) read before the meeting of the British Institution of Civil Engineers, May 21, 1878, by Thomas C. Clarke of Philadelphia. The paper attracted much attention during and after the meeting of the Institution, and was noticed in the SCIENTIFIC AMERICAN. It makes a valuable addition to the literature of civil engineering.

NAUTISCH-TECHNISCHES WOERTERBUCH DER MARINE: Deutsch, Italienisch, Französisch und Englisch. Bearbeitet von P. E. Dabovich, k. k. Schiffbau-Techniker. Herausgegeben von der Redaction der "Mittheilungen aus dem Gebiete des Seeroesens," Pola, Austria.

Of this dictionary the first part of vol. I. has appeared. Whoever from necessity or inclination has had occasion to peruse our modern literature on maritime matters, has no doubt felt the want of a dictionary explaining concisely the technical terms occurring in the different branches of naval science. In the above mentioned work this seems to have been successfully accomplished. Part 1, of Vol. I., which covers the terms from "A" to "Ausblasen," contains the synonymous terms for about fifteen hundred German and Italian words in English and French. The Italian synonyms were added, no doubt, because they are of special importance to Austrian mariners, and, although of minor value to us, will be found a valuable addition, especially as the expressions are also given (in brackets) in the peculiar dialect of Austro-Italian seafaring men. The work will be published in two volumes, one of which contains, arranged in alphabetical order, the German and Italian, the other the English and French terms. Each volume will consist of about 8 parts, of about 80 pages each.

THE PRINCETON REVIEW, now one of the strongest periodicals published, gives in its March number nine long and able papers by the late Professor Taylor Lewis, of Union College; Principal Dawson, Montreal; Rev. Phillips Brooks, Boston; Edward A. Freeman, England; E. de Pressense, France; President McCosh, Princeton; P. G. Hamerton, France; Rev. R. M. Patterson, Philadelphia; and Sir Julius Vogel, New Zealand. Of these contributions the second—"The Genesis and Migrations of Plants"; the sixth—"Final Cause"; and the ninth—"The Islands of the Pacific," are of special interest to scientific readers. The Review is now published bi-monthly, in New York (37 Park Row), and gives the matter of a first rate quarterly at the price of a cheap magazine, $2 a year.

THE GOULDS MANUFACTURING COMPANY, of Seneca Falls, N. Y., have issued the 17th edition of their descriptive catalogue of pumps, engines, rams, and other hydraulic machinery. It makes a book of 224 pages, abundantly illustrated, and handsomely printed. Their list embraces a large assortment of suction and lift cistern and well pumps, force pumps, rotary force and fire pumps, rotary gas exhausters for gas works, gas pumps for oil wells, hydraulic rams, garden engines, patent chilled skeins and boxes, steel amalgam bills, Burrall's corn shellers, and other iron goods.

THE BULLETIN OF THE NATIONAL ASSOCIATION OF WOOL MANUFACTURERS for 1878 contains, in addition to the proceedings of the annual meeting of the association, the address of John L. Hayes, LL.D., on the resources of the United States for sheep husbandry and the wool manufacture, delivered before the National Agricultural Congress at New Haven, Conn., August 29, 1878; also an article on sheep husbandry and wool production in the Argentine Republic, communicated by E. Ollendorf, late Commissioner of Agriculture in that republic.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

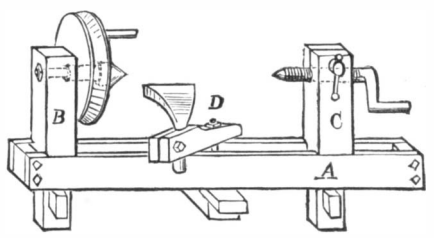
We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) L. F. C. asks if a lathe can be made entirely of wood excepting the centers. A. The accompanying cut shows a lathe made almost entirely of wood. The bed, A, consists of two wooden bars separated by



blocks at the ends, and fastened together by bolts. The head block, B, consists of a single piece of wood having a tenon which fits between the wooden bars of the bed and is secured by a key. In the head block is fixed a center, on which turns a grooved pulley. This pulley may be used as a face plate, and the chucks used in turning may be attached to it. The tail stock, C, has a threaded spindle passing through it, which may be clamped by the transverse screw to prevent it from turning, the tail stock being split to permit of drawing it together against the spindle. The tool rest is secured in the rest support, D, in a similar way, and the latter is secured by a cross piece and wedge suspended by a bolt. For wood and soft metals this lathe will answer very well.

(2) B. S. S. writes: Given a cylinder of 100 square inches and 32 inches stroke; steam is admitted at 1,000 lbs. and expanded 32 times. 1. What is the mean pressure per square inch? What the aggregate pressure? What the aggregate pressure without cutting off? Same for 100 lbs. steam, expanded 10 times? What is the economic effect and why? Instead of cutting off the 1,000 lbs. at 1 inch, suppose we admit the steam through a very small valve and expand 32 times as the piston travels, will the economic effect be the same? If not, give the reason why. A. Mean pressure 125 lbs., assuming no loss by radiation, condensation, or back pressure. We do not understand your term "aggregate pressure." The mean pressure of 100 lbs., expanding 10 times, is 33 lbs. We do not know of any method of comparing the results of "wire drawing" steam to the cylinder, with those of working steam expansively; but it is known in practice that "throttling," as it is called, will produce higher results with a given consumption of fuel, with an engine working either whole stroke or expansively. 2. Steam is said to be decomposed at 1,000° F., and upward. If we make 14,000 thermal units with 1 lb. of carbon, and use 4,000 units to decompose water into half a pound of hydrogen and 8 lbs. of oxygen, which, on burning, makes 16,000 thermal units, have we not 26,000 units for 1 lb. of coal instead of 14,000 units? Where is the fallacy of the statement? A. For reply to your second query we refer you to Clark's "Manual for Mechanical Engineers," or Rankine's "Steam Engine." 3. Do you know of any experiments testing the amount of steam that may be used to create a draught without injury? The books claim that it costs as much to decompose steam as it is worth. Is this so? A. We know of no such experiments, but we do know that it is the most expensive mode of using steam for producing artificial draught.

(3) W. L. writes: I am a constant and instructed reader of your most valuable paper as well as SUPPLEMENT. I seldom find error, but most reliable information that has given me great pleasure, profit, and satisfaction. In the issue dated March 15, 1879, I find that, in answer to a question by R. B. R., as to the weight of locomotives, you fall into what seems to me grave error. You say the Janus weighed 84 tons. I knew the engine well—saw her wrecked to her destruction. Without positive data, I will say that 84,000 lbs. was her extreme weight. I mean the simple engine, without tender, water, or fuel. I further beg to say that I do not believe that there was ever a locomotive built that weighed over 60 tons, if so much—I mean, as above, the simple locomotive. My experience is that no locomotive of that weight could be made to endure. No steel rail can be made to sustain the running wear of such a weight, nor could metal be found for tire that would stand such a stress. I mean an engine stou tenough to make the curves of our American railroads. The Lehigh Valley Railroad Company, at their shops at Weatherly, under the supervision of Philip Hoffecker, the master mechanic, has built several colossal machines, some 10 drivers connected, some 8 drivers connected, with a truck under the front, that do not weigh more than 75,000 lbs., that work on the 150 foot grade and do double the work that the "Janus" did on the same grade. Mr. Hoffecker, as well as all well informed mechanics and railroad men, believe that they are the maximum weight for economy and endurance of the best rail and metal now extant. I would not have written this did I not desire to see the SCIENTIFIC AMERICAN always right. A. You are probably correct; the weight of the engine

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only could not have been so great as 84 tons; this weight probably included water in boiler and the tender with water and coal. "Roper" gives the weight of the heaviest locomotive on the Pennsylvania Railroad as 60 tons, and says it is the heaviest locomotive in the world. An engine of the "Consolidation" class, with cylinders 20x24 inches, weighs 96,000 lbs. A medium class passenger locomotive weighs, with water in boiler, from 65,000 to 70,000 lbs., and tender, with water and coal, 46,000 lbs.

(4) W. C. J. writes: I have been experimenting on a plan for a steam gauge; I find it works well and cannot get out of order. As an atmospheric pressure is 15 lbs. per square inch, twice that would be thirty, three times forty-five, and so on. Now, supposing a piston be so constructed that the pressure of the boiler will compress the air in a tight tube and thus show what the pressure on the boiler is. Also to have the cylinder so constructed that when the piston moves up to the required pressure it shall open a port and let the steam escape. Some time ago I wished to purchase a new steam gauge; I took seven gauges for trial, and connected them all to the same boiler at the same time, and no two were alike. Now, as some of them showed as high as 20 lbs. more than others, how could I determine which was right? A. We advise you not to waste your time and money upon your proposed manometer gauge; they have been tried and abandoned long since. Of course you can purchase a cheap (and poor) gauge, as you can a cheap and poor watch. Some spring gauges are like Pindar's razors, not made to use, but to sell.

(5) C. W. K. writes: I wish to ascertain if there is any rule for finding the quantity of cannel coal consumed, with the following data: Size of cylinder 6¼ inches, stroke 8 inches, number of revolutions 120 per minute, at steam pressure of 80 lbs. A. Find the weight of steam used by your engine, in any unit of time, say one minute or one hour; allow cannel coal to evaporate 7·4 lbs. weight of water per pound of coal; divide the weight of steam used by 7·4, result is coal consumed in same time.

(6) "Subscriber" asks if it be safe to use an engine with 80 lbs. steam, the cylinder being little less than ½ inch thick the thinnest part. It is 22 inches long, 10⅜ diameter. A.-Yes, so long as it receives no extra strain or shock; but do not allow water to work through the engine.

(7) C. F. writes: It is said that 2 inch pipe will not discharge any more water under the same head than as many ½ inch pipes, said ½ inch pipes holding the same amount of water. Give us the difference and the reason why. A. 2 inch pipe will discharge most; 16 pipes ½ inch equal in cross area one of 2 inches diameter. The frictional surface of one 2 inch pipe may be represented by 6, and the frictional surface of 16 pipes, ½ inch diameter, by 25—so the resistance from friction will be 4 times as much in the latter as the former.

(8) D. K. E. asks: 1. Could a small steam engine (screw propeller) be put into an ordinary row boat 16x3½ feet? A. Yes, if the screw is properly immersed. 2. What would the engine cost, and how much power would be required to run 4 or 5 miles per hour? A. An engine with 3 inch cylinder would suit. Cost, about $450 with boiler and shafts.

(9) J. N. L. asks: Is a 1½ steam pipe sufficient to run a 9 inch cylinder, 16 inches stroke, steam engine to full capacity; the steam ports are 5 inches long by ⅝ wide, steam pressure 100 lbs. per square inch? A. No; use at least a 2-inch pipe for usual velocity.

(10) E. J. C.—For information on artificial incubation see SCIENTIFIC AMERICAN SUPPLEMENT, No. 54.

(11) J. L. C. writes: I have a tank in my house supplied with water which communicates with a tank 101 feet off in a direct line by a pipe with 1¼ inch bore; the pipe goes down perpendicularly 3½ feet from the house tank and up perpendicularly 5¼ feet into the outside tank; the open end of the pipe in the house is 2 feet higher than the open end of the pipe in the other tank. 1. How much, if any, will the flow of water be increased by lowering the outer end of the pipe, say 1, 2, 3, or 4 feet? A. If the difference in height of open end of pipes is now 2 feet, and you increase it to 4 feet, the flow will be increased about 40 per cent. 2. Will more water pass through an inch perpendicular pipe 10 feet long, than through an inch pipe 1 inch long? A. Yes, if upper ends are at the same level and both supplied from the same tank or reservoir.

(12) J. L. R. asks: 1. Which will yield the greatest amount of heat: 1 lb. of best coal, or 1 lb. of alcohol when burned to best advantage? A. Coal, about 7 per cent more. 2. Why are not low pressure engines used in place of high pressure? Will they not give same power with far less fuel? A. They weigh more, cost more, occupy more room, and do not give much greater economy as the two classes are used in this country. 3 How many pounds will an ordinary horse pull on a straight pull? A. Necessarily indefinite; depends upon the weight of the horse, etc.

(13) S. C. C. asks: When a train of cars are rounding a curve, on which rail is the greater weight thrown, the inside or outside one? A. Outside one.

(14) J. A. H. asks: What can I use to prevent the forming of scales in a boiler? I am compelled to use water from a well which furnishes lime water. A The mass of lime in your feed water should be separated in the heater; for removing lime scale already formed, use a small quantity of dissolved gum catechu daily, sent in through feed pump; watch carefully its effect, and increase or diminish the quantity as required. A small quantity of oak bark put in the boiler is said to be efficient.

(15) A. H. G. writes: You say in your issue of January 4th, 1879, in obtaining horse power of an engine, multiply area of piston, by pressure of steam, by length of stroke in feet, by double the number of revolutions. Do you not mean: "by revolutions per minute," instead of "double the number of revolutions?" A. No; double the number of revolutions equals number of strokes.

(16) J. H. R. asks: What is the number of threads to the inch in steam pipe? A.:

Inside diameter of pipe.	Threads per inch.
⅛	27
¼	18
⅜	18
½	14
¾	14
1	11½
1¼	11½
1½	11½
2	11½
2½	8
3	8
3½	8
4	8

(17) S. B. & H. W. ask why rotary engines are not more used. A. It is very difficult to keep them tight under continuous use, and in most of them steam cannot be worked expansively, therefore they are not economical.

(18) J. C. asks (1) if there is any way of keeping a cylinder, while in motion, and heated by steam, free from condensation A. Surround your cylinder with a steam jacket and introduce either live or superheated steam. 2. What kind of journal boxes ought such a cylinder to have, that they may cause no trouble from heating? A. Probably phosphor bronze boxes will be best.

(19) A. M. U. asks for a correct method for laying out a cog or spur wheel. A. See SCIENTIFIC AMERICAN, vol. 38, pp. 36 and 149.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

H. M. H.—The bead contains copper, lead, antimony, traces of bismuth, and silver. The crystals are anhydrite calcium sulphate.—I. B. R.—It is galena—lead sulphide. It probably contains a small quantity of silver. The heavy mineral is barytes, or heavy spar—sulphate of barytes.—J. A. W.—It is a bituminous shale. It is impossible to make an analysis of any value on two ounces of water.—A. M.—It is a ferruginous quartz—not probably worth assaying. The dark fragment is an argillaceous shale.—The sample of clay in the Estabrook pen box (no name) contains much iron oxide and silica. It may be useful for manufacturing bricks and cheap pottery, tiles, drain pipe, etc.—J. N. W.—The potter's clay is of fair quality. It would be of more value if properly washed. The color is due to oxide of iron.—C.—The metal is lead—it contains a trace of silver. The mineral is muscovite.—C. D.—It is chiefly iron sulphide pyrite, of little value.—J. C.—The sample is the so-called millstone grit. It is too coarse to be of any practical value. Perhaps better stone may be found lower down.

COMMUNICATIONS RECEIVED.

Fence. By G. T. B.
On the Wagon Wheel Question. By G. S. W.
On the Gary Motor. By C. H. H.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

March 4, 1879,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Air brake relief valve, H. H. & T. C. Osgood..... 212,972
Amalgamator, P. Dickson 212,907
Animal trap, I. R. Spencer..... 212,999
Axle nut, vehicle, G. J. Dykes..... 212,842
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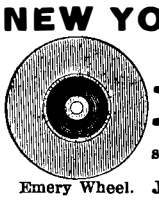

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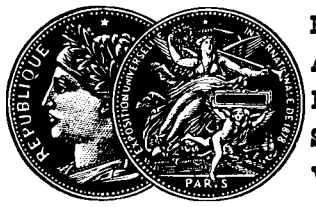

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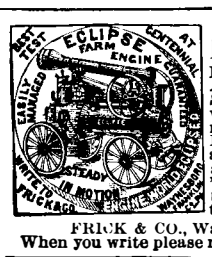

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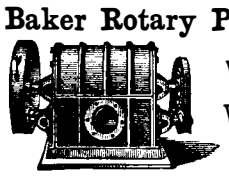

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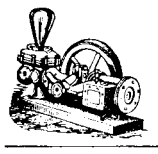

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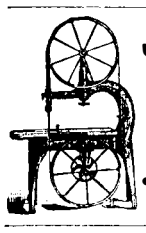

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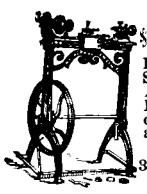

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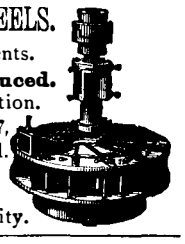

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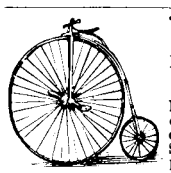

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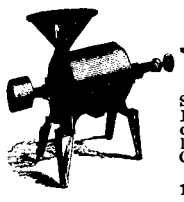

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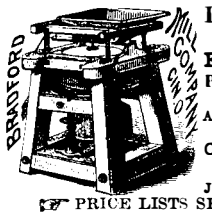

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